NINETY-EIGHTH YEAR

AMERICAN Gas Journal

OCTOBER, 1956

Only Magazine Published Exclusively for the Gas Utility Industry

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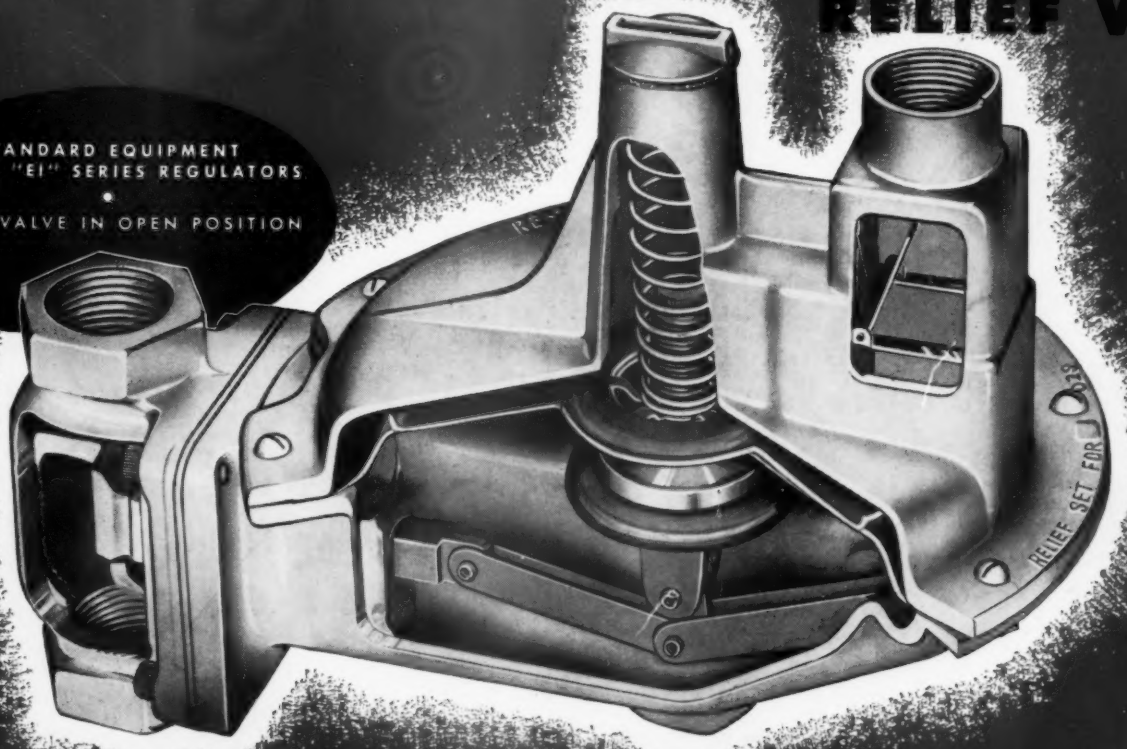
SMITHSONIAN DEPOSIT

REYNOLDS

offers a new unique INTERNAL RELIEF VALVE

STANDARD EQUIPMENT
ON ALL "EI" SERIES REGULATORS

RELIEF VALVE IN OPEN POSITION



Patent Pending

Reynolds now full capacity relief valve has four features in design that make it interchangeable for older models and incorporate unusual performance. These features follow Reynolds' ability to design modern service regulators for close regulation without the use of a small loading tube or restriction to the diaphragm chamber. A new type of rubber relief valve disc, so that a double action sealing effect permits the use of a large relief valve orifice which still seals and relieves within close regulation. Also available as a conversion kit. An automatic quick opening flapper designed for one square inch opening for excess pressure gas and yet has the standard small vent opening for normal regulation. This automatic vent, of all stainless steel construction, also eliminates the high shock-lock off experienced in other type regulators with small or restricted vent openings. The normal vent opening and the relief valve opening are the same, thereby eliminating compact vent piping for indoor installation or two weather caps for outside installation.

GAS CONTROL SINCE 1892

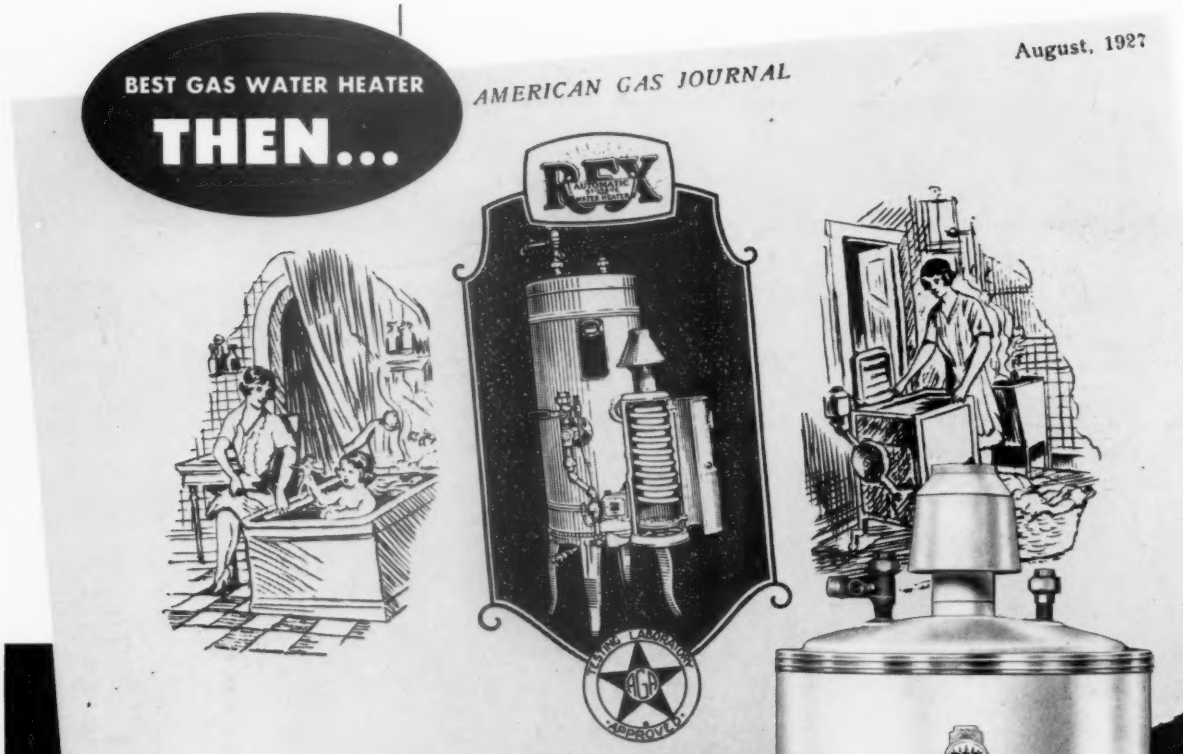
REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana, U. S. A.

CLEVELAND HEATER'S

50th ANNIVERSARY

BEST GAS WATER HEATER

THEN...



Reprint of August, 1927 American Gas Journal advertisement showing Rex Water Heater as it appeared nearly 30 years ago.

BEST GAS WATER HEATER

NOW

REX 50th ANNIVERSARY WATER HEATER

- *BEST BY SERVICE TEST FOR 50 YEARS*
- *BUILT FOR TOMORROW'S NEEDS*

WHEN YOU SELL REX WATER HEATERS YOU SUPPLY THE FINEST IN . . .

BEAUTY • EFFICIENCY • QUALITY
SAFETY • PERFORMANCE • VALUE

REX Home Rated Gas WATER HEATER

THE CLEVELAND HEATER CO.

2310 SUPERIOR AVE. • CLEVELAND 14, OHIO

Write For Your Copy Of The Rex Catalog, TODAY!

Made of malleable iron. Single massive bolt. All sizes, 1/2" to 12" inclusive. For steel, cast iron and Transite pipe.

M. B. SKINNER COMPANY

SOUTH BEND 21, INDIANA, U. S. A.

SKINNER-SEAL SERVICE SADDLE

The man in the picture isn't hanging out the family wash.

As a matter of fact, the family wash is hanging him.

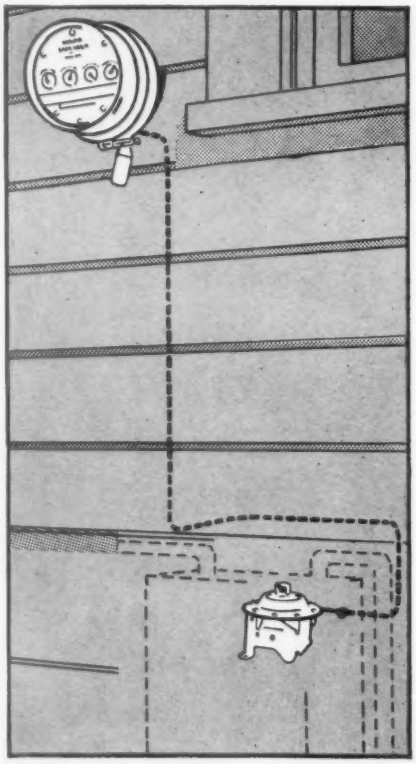
And it isn't even his family. The man in the picture is a gas meter reader. His job is to go down into a lot of strange basements and find out how much gas the customers have been using.

In doing this, he frequently runs into some uncomfortable situations. For instance, we know of a gas meter reader who went down into the basement of a house in 1942 and was never heard from again.

Naturally, it put his company in an embarrassing situation – they didn't know how much to charge for the amount of gas used.

Now this sort of thing *can* be avoided. You can install Sangamo Gas Telemeters on your present tin meters. The Telemeter brings the gas meter reading *outside* the premises. And the nice thing about a Telemeter is that no one who ever tried reading one has ever disappeared.

We wrote everything down we thought you'd like to know about Telemeters and had it published under the title, "Outdoor meter reading is here . . ." or Bulletin 802. We've reserved a copy for you, so write for it today.



it's easier to get the reading ON THE OUTSIDE!

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

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American Gas Journal, established 1859, is published monthly except November, then semi-monthly, by The Petroleum Engineer Publishing Company, P. O. Box 1589, Dallas 21, Texas.

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Printed in U.S.A.

AMERICAN Gas Journal

NINETY-EIGHTH YEAR

VOLUME 183

OCTOBER, 1956

GAS TECHNOLOGY — OPERATIONS — EQUIPMENT — MANAGEMENT — UTILIZATION

NUMBER 10

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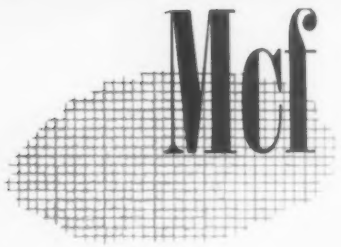
AMERICAN GAS JOURNAL, October, 1956, Vol. 183, No. 10. Published monthly (except November, then semi-monthly) by The Petroleum Engineer Publishing Company, 800 Davis Building, Dallas 2, Texas. Second class mail privileges authorized at Dallas, Texas. Executive and Editorial Offices at 800 Davis Building, P. O. Box 1589, Dallas 21, Texas.

OCT 16 1956



Price equality between gas and electric clothes dryers, long sought by gas utilities and gas appliance dealers, has become a reality with the announcement that Bendix has equalized prices. The move gives gas dryers every competitive advantage. Accelerated sales and promotional action by gas utilities has been urged by the AGA to bring the substantial sales and production gains to maintain the lower prices. Other manufacturers are expected to follow Bendix's action.

Speaking of appliances, a Norge executive, Harold Bull, declares that by 1960, more than 74,000 major home appliances will be sold every 24 hr, an increase of 41 per cent over the 52,300 now sold daily. Bull, v-p in charge of distribution for Norge, said clothes dryers will have the greatest gain, followed by washers, freezers, ranges, water heaters, and refrigerators.

In Texas in September, five utility company representatives from the sales department of as many companies saw for the first time a Texas natural gas field, how a pipe line company operates, and visited a "dude ranch." They were guests of Transcontinental Gas Pipe Line Corporation, which invited the five (with wives and/or husbands) to get a first-hand look at the transmission and production end.

Can a municipality take over a city's gas distribution system through condemnation by right of eminent domain and then force the gas utility company to sell it gas at wholesale rates? Such a case is now before the Nebraska State Railway Commission, which has taken under advisement the question of whether it has authority to intervene in such a dispute. Involved are the municipality of Bayard and North Central Gas Company. Nebraska statutes do not spell out regulation of natural gas companies in intrastate commerce.

Largest single pipe line construction contract ever awarded in Canada has been let to Dutton-Williams Brothers, Ltd., Calgary, for 875 miles of pipe for Inland Natural Gas Company, Ltd. Included are 360 miles of 4 to 12-in. main line, which will blanket the entire British Columbia interior, and approximately 2,500,000 ft of local distribution system piping. Inland is a subsidiary of Pacific Petroleums, Ltd., which also controls Westcoast Transmission Company, Ltd., slated to be exclusive supplier of gas to Inland. Work will continue all winter in the warmer parts of British Columbia with five crews working, and three crews will work on the main line in the summer of 1957. Ford, Bacon and Davis, Canada, Ltd., is doing the engineering of the entire system.

In Toronto, natural gas service has brought another welcome surprise to customers of Consumers' Gas Company — a third voluntary rate reduction in 19 months, which will mean a $1,000,000 a year cost of living drop. Total savings since February, 1955, have been more than $4,000,000 since manufactured gas was replaced by natural gas.

Idaho's Public Utilities Commission has petitioned the FPC for right to intervene in the case of 12 Idaho cooperatives seeking natural gas allotments from the new Pacific Northwest pipe line that crosses the state. The PUC opposes the cooperatives for several reasons, including safety (under present Idaho laws, the PUC cannot impose safety regulations on cooperatives), and public interest (one company would be economically superior to a group of unrelated cooperatives). Intermountain Gas Company has applied for franchises in the 12 communities and says the cooperatives are illegal.

Who works where? One out of every seven U. S. workers in non-agricultural occupations (not including the armed forces) works for the federal, state, or local government today. Federal employee numbers have been reduced 424,000 in the last four years, but state and local workers continue to increase. A study of employment statistics by the National Association of Manufacturers shows that, of 4,900,000 state and local government employees, three of four are local, and 45 per cent are in the field of education.

First phase of a five-year project to build a city distribution system for natural gas in Winnipeg has been completed by Winnipeg and Central Gas Company. The privately owned utility this year has built the first six miles of a 24-mile, 14-in. main that will loop the city and two river crossings. First gas will probably be delivered next fall.

In Chicago, a revolutionary new type of central air conditioning unit, using gas for operation, was demonstrated in late September by Rheem Manufacturing Company. The new approach uses an extensively refined jet principle of cooling, previously used in only very large commercial or industrial applications. The unit is small — four feet long, two feet wide, and four feet high. It provides both cooling and heating, can be placed inside or outside. A single, conventional thermostat automatically changes the unit from cooling to heating, or vice versa. More details are given on page 64 of this issue of *American Gas Journal.*

An Important Problem That Needs Action. The Federal Housing Administration deosn't know enough about air conditioning, says one of its commissioners. And the result is that new home buyers are suffering because of FHA's ignorance. Air conditioning manufacturers and builders alike, says FHA, are to blame.

In any event, the big potential market for central air conditioning of homes of all sizes — and it's a mighty important market for low-operating-cost gas A/C equipment — is being hurt.

Among the effects of the FHA's lack of knowledge are: FHA allows insufficient credit in appraisals, resulting in adding of air conditioning cost to the down payment on a home; FHA requires excessive minimum income requirements for families buying air conditioned homes — as much as $200 a month more than buyers of the same house without central air conditioning — although annual cooling costs aveage only $100 a year; FHA won't approve house designs that take advantage of air conditioning — such as reduced window sizes, etc.

Gas utility companies — with a big stake in the market through buildup of summer load in residential gas air conditioning — can help educate the FHA by cooperating with builders, realtors, manufacturers, and other groups.

MUELLER®

make pressure connections...

SAFELY!

Regardless of type of main – cast iron or steel – you can make practically any type of service connection *under pressure*, without loss of gas.

Mueller No-Blo® Service Tees, Valve Tees, and Save-a-Valve Drilling Nipples may be attached to cast iron mains through Mueller single or double strap service clamps.

All of these fittings, *plus* Curb Valve Tees, Steel Valves, Capped Valves and Line Stopper Fittings, may be welded to steel mains. So regardless of type of main, a wide choice of service connections in a complete range of sizes lets you meet specific needs.

And all of these fittings can be put in service with the Mueller "D-4" Drilling Machine – in complete safety – without loss of gas.

"D-4" Drilling Machine
Drills ¼" through 2¼"
500 p.s.i. maximum working pressure at 100°F.
250°F. maximum temperature rating at 375 p.s.i.
Length of travel 14"

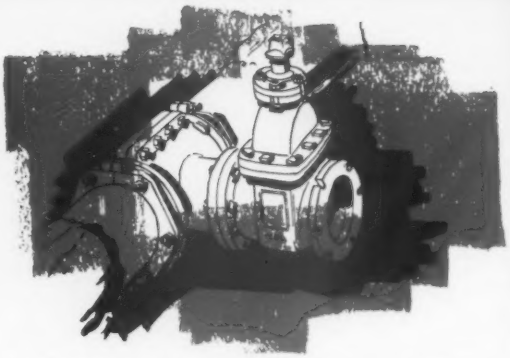
NO-BLO®

Contact your Mueller Representative or write direct for complete information on the "D-4" and other Mueller Drilling Machines. Size of cuts range from ¼" through 12".

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS



STEP 1: Attach. Clean main. Place tapping sleeve or cross in position and fasten securely to main. Tighten mechanical joints. Attach gate valve or extension stopper fitting.

STEP 2: Mount. Mount "CC" or power operated "C-1" drilling machine on valve (in open position) with proper shell cutter and adapter.

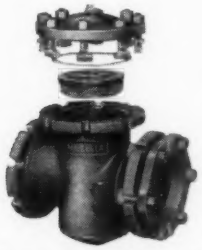
MUELLER® NO-BLO® Method

Lateral from cast iron mains...

Mueller Mechanical Joint Tapping Sleeves and Valves provide a safe, simple method of running lateral connections from a cast iron main. Connection is made with a tapping sleeve, or tapping cross, in a safe No-Blo® manner, with no blowing of gas or interruption to flow in the main.

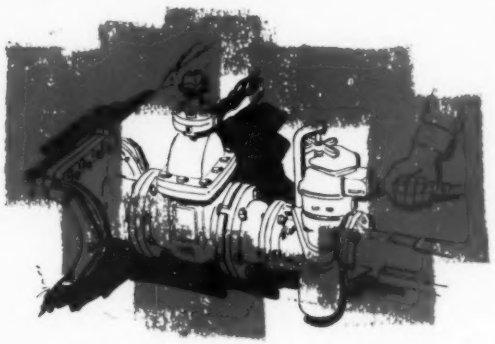
Extra long body of tapping sleeve or cross is of heavy duty construction and actually strengthens the main at the point of connection.

Tapping valve with "O" ring stem seals has similar construction to Mueller non-rising stem gate valves. Seat opening in tapping valve is larger than nominal size to permit making full diameter cut. Valve sizes 2" through 12".

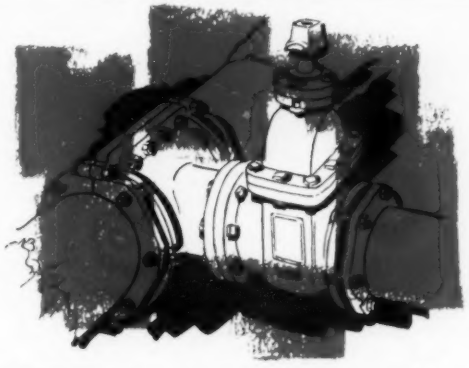


Extension Stopper Fitting

If desired, an extension stopper fitting may be used in place of the tapping valve on 4", 6" and 8" sizes. After cut in main is completed, fitting is stopped off in conventional manner, permitting removal of drilling machine and attachment of lateral.



STEP 3: Drill. Advance boring bar until pilot drill strikes main – retract two turns – set automatic feed at zero and engage. Make cut. Retract boring bar.



STEP 4: Complete. Close valve (or insert stopper) and remove drilling machine. Attach lateral to outlet of tapping valve or stopper fitting and open valve. Lateral is now complete.

Write for the free No-Blo® Method booklet, "Safe Operating Practice". It shows how other gas installations are made in a safe manner, without escape of gas.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

Point No. 7 of the Action Program for the Gas Industry Development says:

Each gas utility, and each combination utility company, as to its gas operations, is urged:

TO INSIST THAT INDIVIDUAL MANUFACTURERS SHALL BEAR THEIR SHARE OF THE RESPONSIBILITY FOR THE UPGRADING AND PROMOTION OF QUALITY GAS APPLIANCES...

RUUD GAS water heaters are continually upgraded

Think of it! 90% of the water heaters in use or sold today are sub-standard. They simply can't keep pace with the modern automatic washer. A critical situation, indeed. With 10 million automatic washers in use today, and a predicted 25 million, or more in use by 1960—what's going to happen to *your* water heating load?

It's up to you to protect it. Sell and promote only UPGRADED water heaters—quality UPGRADED RUUD water heaters.

Ruud is constantly upgrading its water heaters to give you the highest quality product for your customers. Ruud Laundry-Rated* Water Heaters assure plenty of 160° hot water for the continuous load-after-load demands of *any* automatic washer.

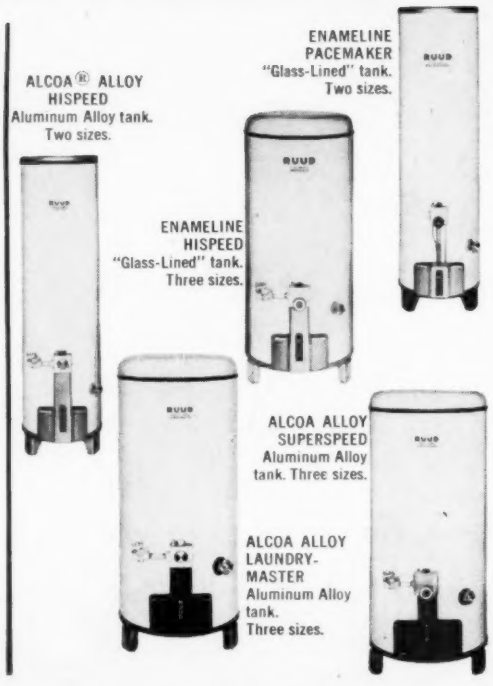
And, Ruud offers you a complete upgraded selling and promotion plan to help you place your Modern Gas Home Laundry Program in operation. For full information, call your Ruud representative, or write:

RUUD GAS WATER HEATERS

Kalamazoo 24, Michigan • Toronto 14, Ontario

*Trade Mark

® Aluminum Co. of America



cordial customer convenience

The new REMINGTON RAND Sectional Customer Service Counter is designed for combination of cashiering and bookkeeping. It offers custom made beauty and efficiency without custom-made limitations—at a mass-production price.

Rapid face-to-face service to customers is provided. The counter is ideal height, and there is a continuous parcel shelf for resting packages or bundles. The working area side is compact without being crowded. Customer service and history records are within arm's reach in the SAFE-KARDEX cabinets in the rear.

With complete facilities within arm's reach, the clerk works comfortably seated, ending the usual "standing" counter cashiering —the fatigue and errors which result.

Certified, insulated pedestal units provide 24-hour, point-of-use protection against fire for vital records. Uninsulated pedestal units are available for records which can readily be duplicated. In larger offices, two or more units may be joined, providing any desired number of work stations.

See for yourself the many advantages of the Sectional Customer Service Counter. Send for our free booklet on the subject, SC764. You'll find it interesting and informative. Just write Room 2018, 315 Fourth Avenue, New York 10.

Remington Rand

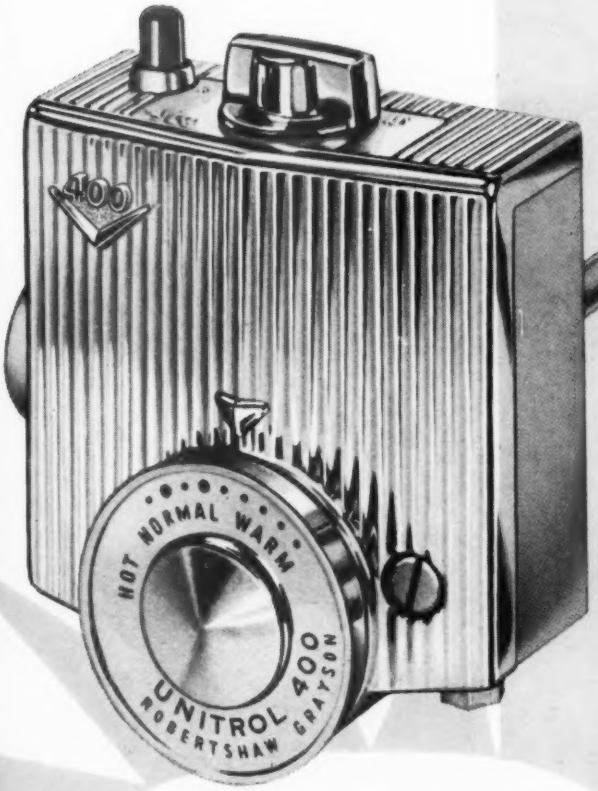
DIVISION OF SPERRY RAND CORPORATION

BACKED UP BY MORE THAN TWENTY MILLION CONTROLS

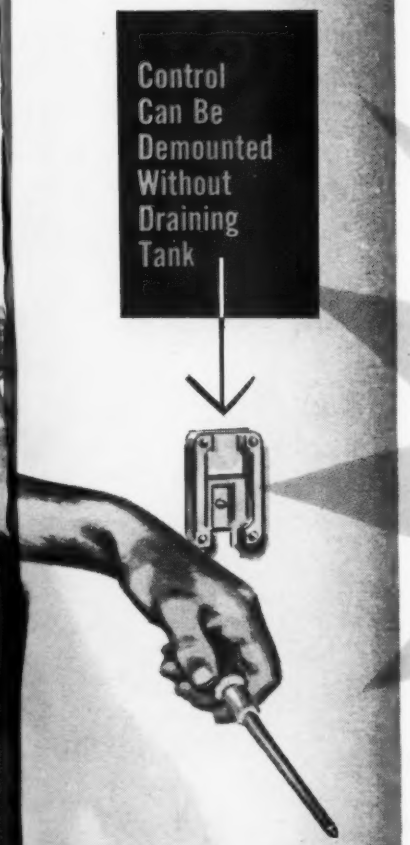
When the Model 400 UNITROL® Gas Water Heater Control was presented to water heater manufacturers it combined the lessons learned in more than 57 years of experience with the know-how gained in the manufacture of more than 20 million units and the knowledge accumulated by watching these controls in action under all gas and water conditions. That's why UNITROL 400 represents the finest water heater control on the market today.

Robertshaw-Grayson thermocouples and pilots belong together — because they are designed to work together.

MODEL 400



- Snap-on gas cock handle easily removed. Supplied in gold or silver.
- New "C" valve adjustable with a coin — no screwdriver or special tools needed.
- Snap-on cover requires no tools for removal.
- Corrosion resistant valve assures positive closure.
- Easily removed gum and dust filter keeps pilot light from clogging.
- Big capacity — delivers up to 90,000 btu's per hour. 100% gas shut-off.
- Magnet assembly easily removed in the field if necessary.
- Built-in dust trap inside control keeps any dust or scale out of working parts of control.
- Easily calibrated and adjusted from the front of the control.

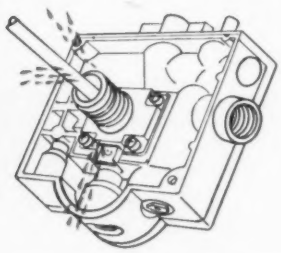


Robertshaw-Grayson UNITROL®

GAS WATER HEATER CONTROLS

America's most beautiful water heater controls

BY WORLD'S LEADING MANUFACTURER



Air-Gap Construction throughout prevents water entering gas lines.

MR. CONTROLS®

Robertshaw-Fulton CONTROLS COMPANY

Grayson Controls Division, Long Beach, California

Robertshaw-Fulton Controls (Canada) Ltd., Toronto

Robertshaw-Fulton Controls (Australia) Pty. Limited, Burwood, N.S.W.

SELECT THE CONTROLS THAT HELP YOU SELL

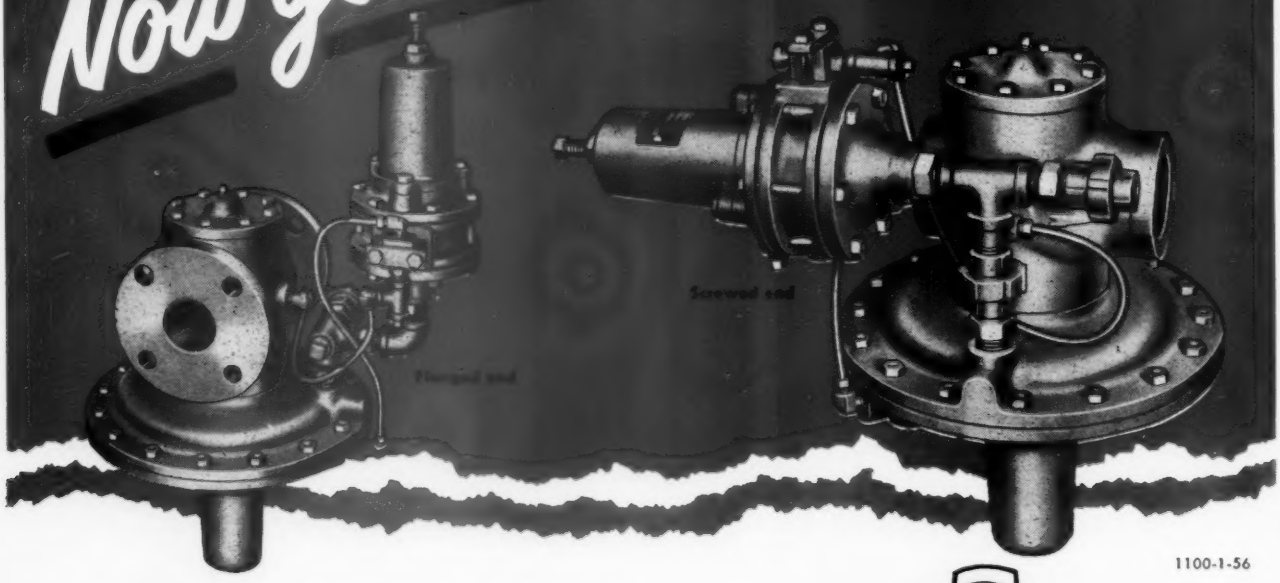
LINE PRESSURE GOING UP!

MEMO
FROM THE OFFICE OF THE PRESIDENT

Geo:— Considering raising line pressure Better check this— Now good up to 400 psi
Relm.

Chaplin-Fulton '1100' REGULATOR

Now good up to 400 psi



1100-1-56

Now, more versatile than ever—good up to 400 psi. Your choice of three body assemblies—

2″ flanged 250 lb.	rated for 400 psi
2″ screwed end	rated for 400 psi
2″ flanged 125 lb.	rated for 175 psi

All suitable for outlet pressure range from ounces to 150 psi with no change required in regulator or pilot—just change the pilot spring. It's accurate—versatile—compact! A good buy!

Why stock two, when Model '1100' will do?

And, if 400 psi is too low, why not try the all-steel Model '1200', good up to 1200 psi inlet and 600 psi outlet?

Full information on request.

ACCURATE CF MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 20, Pennsylvania

Model 26—Boiler

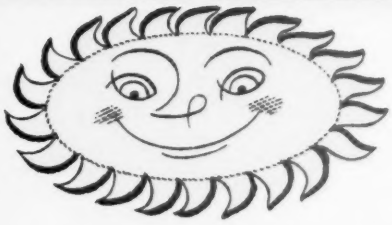
GROW BIGGER WITH

bryant

and here's one way you can

GROW BIGGER WITH

bryant



REAP THE PROFITS FROM BRYANT'S FIELD-TESTED and proven

MONEY BACK GUARANTEE PLAN

that increases furnace sales

This is a proven furnace sales-building promotion that will double and treble your heating sales in the off season. It is open *only* to qualified Bryant dealers. Learn how you can qualify to participate in this proven sales-building promotion.

The finest, fairest satisfaction guarantee offer ever made

A sale plan that offers guaranteed furnace performance!

If your customer isn't satisfied he gets back full furnace cost!

A straight forward no-strings-attached offer that makes sales

and here are 8 more reasons why you'll GROW BIGGER with BRYANT

1. Your customers know and trust the name Bryant . . . famous for 47 years as the leading name in home comfort.
2. From small home to mansion there's a Bryant to fit the budget and the need in gas or oil furnaces, boilers, air conditioners, space heaters, unit heaters, water heaters.
3. You build customer confidence when you install Bryant . . . the highest quality home comfort equipment built.
4. You profit more with Bryant because of the Bryant dealer development program, the most complete in the industry.
5. You get sales-building tools that increase sales and profits.
6. You have the help of a nearby Bryant distributor who gives you complete engineering, sales and service help.
7. You are backed by powerful national advertising.
8. You get complete co-op advertising to build sales in your own community.

BRYANT EQUIPMENT FEATURED IN "MONEY BACK" PROMOTION
Model 26 Boiler
Model 319 Furnace
Model 318 Furnace
Also Model 225 Boiler

Be Mr. B. in your community!

Every home owner who is thinking about new heating equipment for his home will want to know the details of Bryant's exclusive *Money Back Guarantee.* That's why it has been a sure-fire prospect getter wherever it has been used. Get the details today. Learn how simple and straight-forward it is. For the name of your nearby Bryant distributor, write, Bryant, 48 Monument Circle, Indianapolis 4, Indiana.

grow bigger with

bryant

Push-button selector speeds coded data in Gulf Interstate's telemetering system

You are looking at a special push-button private line teletypewriter device developed by the Bell System and used by Gulf Interstate Gas Co.

The company uses the teletypewriter as a recorder in its digital telemetering system, which provides automatic transmission of operating data. Such data includes engine speeds as well as suction and discharge pressures at five remote compressor stations.

The dispatcher in the company's Houston headquarters simply pushes the proper buttons. The selected distant station is instantly on the circuit. Coded telemetered data is then received directly on the teletypewriter in the form of an accurate, easily read record.

This unique selector unit is another example of how equipment developed by the Bell System meets communication needs.

The Bell System welcomes the opportunity to work with you in a study of your special communication requirements. There's no obligation.

Bell Telephone System

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER CHANNELS FOR: DATA TRANSMISSION • TELEMETERING REMOTE CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

Free Enterprise Brings New Energy To the Booming Pacific Northwest

Ray C. Fish
Chairman of the Board, Pacific Northwest Pipeline Corporation

NATURAL gas is opening up a new frontier in the Pacific Northwest as dramatically as the Lewis and Clark expedition opened up the territory to later thousands who were to travel the Oregon Trail. The same romance and excitement is there today as men of vision, energy, and resourcefulness are demonstrating that free enterprise and initiative build a greater America when given the opportunity.

Of greatest significance is the fact that the Pacific Northwest Pipeline, and the entire gas industry, have grown and assumed new responsibilities entirely without government loans, subsidies, or financing guarantees. Free enterprise at work has made the gas industry the sixth largest in this country, adding immeasureably to the growth and prosperity of our economy.

As the Pacific Northwest system begins full scale operation, full credit must be given to the pipe line construction forces that made the line a reality. Fish Northwest Constructors' president, R. D. Ricketts, led the team that overcame mountains, deserts, rivers, and weather to set new records for pipe line construction. The sacrifices and efforts of every man and woman connected with this great project have not gone unnoticed.

When initial market surveys were made of the Pacific Northwest in 1950, it was obvious that natural gas could fill a critical need for large supplies of cheap fuel. Competition for the right to serve that rich potential market was keen and interested firms made every effort to prove the area could be served cheaply and efficiently. From the outset, regardless of who won the battle, the people of the northwest were bound to profit.

When the stormy sessions before the Federal Power Commission were over, the best aspects of each plan contributed to the successful development of natural gas for the area. During 1957, the market will be served from fields in New Mexico and the Rocky Mountain area through nearly 1500 miles of main land and 800 miles of laterals. Late in 1957, Canadian gas will be available through the facilities of Westcoast Transmission Company, Ltd., connecting with the Pacific Northwest system at Sumas, Washington.

This unique two-way supply will provide ample volumes of cheap fuel for many years to come. With supply sources on both ends of the line and a route crossing some of the most productive and potentially productive gas lands in North America, Pacific Northwest will meet every need for expansion of industry and new populations already developing in the northwest.

Pacific Northwest is now developing nearly one-half million acres of gas reserves in the San Juan Basin and has contracted for additional supplies from other fields in Colorado and Wyoming. New reserves are constantly being dis-

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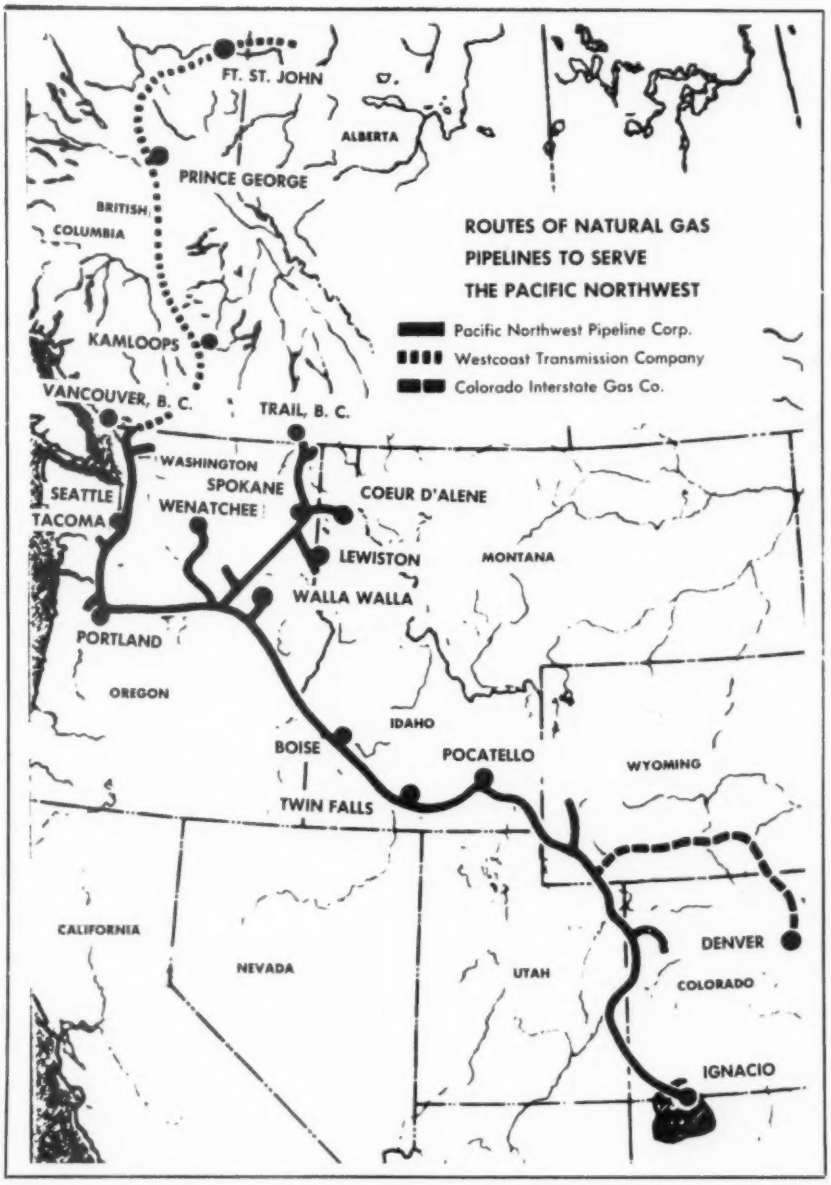
Ray C. Fish and four associates started Fish Engineering Corporation in 1946 with some $60,000 working capital. Although the young firm had some tough going with its first contracts, Fish set his sights on bigger jobs. His keen imagination and sales ability paid off and jobs came fast. Habitually short on working funds, when a new contract was signed, Fish then had to sell the bank on borrowing enough money to complete the job. Before long, he had borrowed nearly $1,000,000 and aside from the contracts, his entire assets consisted of a desk, two chairs, and a typewriter.

Since that time, Fish has handled nearly one billion dollars in contracts and has actively participated in promoting and building three large gas pipe lines (Transcontinental, Texas-Illinois, and Pacific Northwest Pipeline Corporation). He is chairman of the board of the latter company, and recently announced a $20,000,000 subsidiary line that will carry crude and products from New Mexico to Salt Lake City.

Fish grew up in Rhode Island, where his father was a commercial fisherman. After boyhood jobs in textile mills nearby, he drifted west, digging coal in Utah and working in western oil fields. He picked up two years of college at the University of Utah. In 1927 he went to work for J. A. Campbell Company, of Los Angeles, supervising the engineering and construction of gasoline and refining plants.

Three years later he joined Stearns-Roger Manufacturing Company, of Denver, where he stayed for 14 years, designing and constructing all types of oil industry plants.

When Tennessee Gas was started in 1943, touching off the great transcontinental pipe line race that would later mean great profit to his companies, Fish became vice president and director. He resigned in 1946 to form his own companies.



covered in the Peace River fields of Canada.

The benefits of the pipe line are not restricted to Washington and Oregon. Additional customers will be served in Idaho, Utah, and Colorado. Along the line, many exploratory wells are being drilled that were previously unprofitable, providing better utilization of our natural resources.

Canadian and American industry have grown with the new construction, opening up new jobs for thousands of workers. The defense and industrial development interests of both nations will be better served and the joining of the two pipe lines at the International Boundary will act as a further bond between two proven good neighbors.

Estimates of future population growth of the Pacific Northwest are highly optimistic. A recent business survey predicted that the Portland, Oregon, area, which now has a population of 600,000, will grow to 1,000,000 by 1975. A growth in energy supply must be tied in with every population growth in the United States. In this case, natural gas is leading the way, encouraging and seeking industry and investment to provide new jobs and opportunity for new populations.

An interesting fact of industrial development is the manner in which basic industry gives impetus not only to general prosperity and expansion of business, but to the creation of other new plants based on key industry. As an example aluminum is first reduced on the Gulf Coast and then sent to the Pacific Northwest to be transposed into actual metal. At present, the aluminum bars produced there are largely shipped out of the state to other areas where natural gas is used in the manufacture of the "end use" product. It is significant that end use plants, such as extrusion and rolling mills, employ roughly five times as many people as the reduction plants. Natural gas will mean that more end use plants will be built in Washington and Oregon.

New industries in the northwest will in many cases utilize natural resources previously undeveloped. For any area to enjoy substantial industrial development at least three basic essentials of electrical power, cold water, and a satisfactory fuel must be available. Two of these have been available for many years; natural gas is the third element that will provide the impetus for accelerated economic and industrial expansion.

Much attention has been focused on a so-called competitive battle to be waged between electricity generated by the great hydro-electric system of the region and natural gas from the Southwest. Natural gas is not, and never will be, in competition with hydro-electric power. It will be complementary to electricity. The initial volume of gas available to the area exceeds in thermal energy the total output of all the presently installed hydro-electric generating capacity in the northwestern states.

Natural gas will relieve the shortage of power and make it possible to release electricity for wheel turning energy. All industry, in establishing new plants, must be assured of ample electricity as well as other fuels. Any surplus of energy at the outset will rapidly be absorbed by new applications and industries.

The employees of Pacific Northwest Pipeline Corporation and the distribution companies of the northwest are looking forward to even greater participation in the revolutionary developments now under way. At the same time, the entire industry is aware of the serious responsibilities undertaken, and pride evidenced in a job well done is tempered by a sincere sense of humility.

PNWPL—Newest Artery Has Colorful, Adventurous Background, Promising Future

THE story of Pacific Northwest Pipe Line Corporation began in 1949, built around the leadership of Ray C. Fish, head of Fish Engineering Corporation of Houston, which had been successful in its participation in the formation and construction of three major gas pipe lines. In the Pacific Northwest, Fish saw the last great market for natural gas in the United States.

The new area was promising. Here was a concentration of people and industry in a rapidly expanding area already rich in resources. In this market area was a regional population of nearly 5,000,000 persons with expectation of 8,000,000 by 1975. Industry had been attracted to the region by low electrical rates—the result of government subsidized power projects — and the availability of raw materials. The Fish interests sought to supply the other basic essential of industrial development — a satisfactory low cost fuel backed by private enterprise.

Construction in the Columbia River gorge between Pendleton and Portland.

Two years of intensive study and planning went into the project to link extensive gas reserves in the Rocky Mountain area with gas hungry markets in the northwest.

Lengthy hearings before the FPC were finally resolved on June 18, 1954, with a certificate of necessity granted authorizing Pacific to construct facilities to serve markets in Colorado, Wyoming, Utah, Idaho, Oregon, and Washington.

The original certificate provided for 1466 miles of main line to move gas from the San Juan Basin to the Northwest markets. Financing was completed and construction began in June, 1955. After the original authorization in 1954, the market was surveyed again and found to require additional gas supplies. This led to a move to import natural gas from Canada, providing a dual source of supply.

In a precedent setting move on November 25, 1955, the FPC authorized importation of 300,000,000 cu ft of gas per day, requiring expansion of facilities in the state of Washington. Total of all authorizations has brought construction to 2460 miles, of which 1481 are main line and 979 are sales and supply laterals.

Gas Supply

The primary source of gas is in the San Juan Basin where Pacific has under way an extensive drilling program. Gas is also purchased from Piceance Creek and Rangely fields in Colorado, and Big Piney field of Wyoming. Gas explorations have been spurred throughout Western Colorado, Utah, and Wyoming, areas potentially rich in gas reserves.

Pacific has also signed a long term contract with Westcoast Transmission Company, Ltd., to import 300,000,000 cu ft per day from the Peace River fields of Northern Alberta and British Columbia. This dual supply will provide a total of 643,000,000 cu ft per day by 1958, with 100,000,000 cu ft allocated for Colorado Interstate Gas Company. Design features of the line take advantage of the several sources of supply and large market areas to be served.

Building the Line

Fish Northwest Constructors, Inc., headed by R. D. Ricketts, are agents for Pacific in the building of the line under a turnkey contract.

The company assembled key personnel from throughout the industry, obtaining men with many years of experience to give "know how" to the construction and operation of the project. Some of these experienced men will become members of the pipe line organization upon its completion. How well they have performed their task can be found in the construction record, which broke all records for pipe line installation.

Where the Line Goes

The route of the pipe line crosses some of the most difficult terrain in the United States. Beginning at Ignacio, Colorado, the 26-in. line runs northward through the rocky, arid Colorado plateau of eastern Utah to Green River, Wyoming. Near Rock Springs, Wyoming a connection is made with Colorado Interstate Gas Company's line that takes gas for delivery to north central Colorado markets.

A 22-in. line then crosses southern Idaho ending at Umatilla Junction, Oregon. After the main line leaves Fort Bridger, Wyoming, until it reaches Fort Walla Walla on the Columbia River, it follows the route over which pioneering generations drove their Conestoga wagons — the historic old Oregon trail. A 26-in. line runs from Umatilla Junction to the international boundary near Sumas, Washington, where it will connect with the Western Transmission Company pipe line.

Fish Northwest Constructors followed the concept that good engineering is the prime criterion of a sound, economic, and practical pipe line. Few items of sophistication and automation were included. Rather, attention was devoted to the immediate task at hand

— supplying natural gas in adequate volumes to the market with safety, dependability, and practicability.

Accepted engineering practices of sound pipelining were followed. All line pipe on the transmission system meets API 5LX-52 specifications. The line has nine major river crossings, including three crossings of the Green River within a 60-mile section, two crossings of the Snake River and three crossings of the mighty Columbia River.

Compressor Stations

A total of 82,780-hp in 13 compressor stations is being installed on the line. Two booster stations, totaling 5720-hp will deliver gas into the line from fields along the route. Of the 13 stations on the line, 11 are located more than 3000-ft above sea level and five of these are above 6000-ft above sea level. The Big Piney booster station is at the highest elevation—7325 ft above sea level.

Gas will be dehydrated at the well head. Gas from the San Juan fields will enter Station No. 1, then go through the hydrocarbon extraction plant and on to the main line. Six 2000-hp compressors at Station No. 1 will boost gas pressure to 800 psi. This 12,000-hp installation is the largest on the line.

Extremely cold weather conditions along part of the route make necessary special winterizing precautions. All extra efforts are being made to avoid hydrate formation. With the exception of Station No. 1, gas goes through all of the stations without undergoing any cooling.

"Anything But Scenic"

Although working through some of the most scenic terrain in the United States, most of the subcontractors call the route anything but scenic. Extremely hot conditions and temperatures as low as —40 F were encountered along the line, along with desert conditions in the south and swampy, wet conditions in the north.

Crossing Douglas Pass in the northwestern corner of Colorado, pipeliners fought a rapid rise from 4300 ft to a maximum of 8200 ft within a short distance. This area is usually closed in December and reopened in May. The winter construction schedule, however, required that valves be set. Personnel used bulldozers through 15 ft of snow in many places and got to the locations in two four-wheel-drive jeeps chained together to travel the mountain roads. The Green River Crossings had to be made in the mountainous and desolate area along the Utah-Southern Wyoming line. Fifty-five pipe line miles separate Green Crossings No. 1 and No. 3. Some 300 miles of travel are necessary during the winter months to cover the same distance. Even during the summer months, existing roads wander nearly 150 miles through the rough country.

Scrubbers at PNWPL Station No. 1 gleam in the bright western skies.

Construction schedules did not permit work to stop during the winter months at the Big Piney Booster Station, coldest spot along the route, with temperatures sometimes reaching — 45 F. Gas from nearby fields was used to provide heat for the construction workers and to keep the equipment operative. Foundations for the stations were poured during the winter months, using burners under tarps to keep the material from freezing.

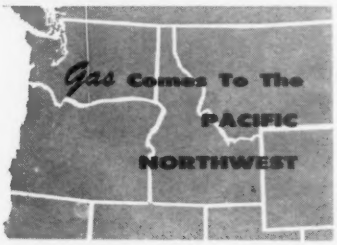
The Blue Mountain region in Oregon is another particularly difficult area. Snow during the winter was five feet in depth on level ground, if any, with temperatures of 26 deg below zero, accompanied by high winds. Only one spread had to shut down during the winter months.

The spring months in Oregon and Washington were equally difficult because of the unusually heavy rains turning the land into a sea of mud. The rainy conditions had one compensation in that engineers and surveyors were able to pre-determine and avoid slide areas that were loosened by the wet conditions.

Construction during the summer and fall of 1955 encountered conditions exactly opposite those in the State of Washington. Ankle-deep dust and sand, whipped by high winds, slowed contractors and men. Visibility was reduced to almost zero on many occasions. Contractors could not run trucking equipment without towing by tracked vehicles. Respirators were worn by many of the men during some of this construction period. Some rock conditions were encountered as well as coarse gravel, causing coating and padding difficulties. Contractors were granted the option of hauling dirt or wrapping the pipe with rockshield. Long hauls were required to provide dirt for the bottom of the ditch in some instances.

Some of the roughest terrain on the entire line lies north of the Columbia River in Washington. Rough terrain, deep gorges and sizable rivers must be crossed. Heavy timber is encountered in most of the sections crossed. Some of the steep gorges require one to two tractors to hold one working tractor in place.

Familiar landmark, WNG's Seattle gas manufacturing plant on shore of Lake Union, stands idle now that natural gas has arrived. It will be kept in standby readiness for abnormal peaks or emergencies.



Washington Natural Gas Forms "Battle Lines" for GIANT MARKET GROWTH

Norbert O. Fratt,
Vice President in Charge of Sales,
Washington Natural Gas Company

IN the next five years, Washington Natural Gas Company intends to double its number of customers and increase the sale of natural gas by eight times over the annual average for manufactured gas. While this goal may seem lofty, the company is confident it can and will be reached.

Although we have passed our first natural gas sales goal, for the sale of interruptible industrial volumes, with over 5,000,000 cu ft to spare, we are by no means complacent.

Already we have begun an aggressive campaign to add as much firm load as fast as possible, and we are taking a particular bead on the house heating market.

New Concept in Load-Building

Pacific Northwest utilities have a market condition and a load situation that may be unique in the gas industry.

In order to get the natural gas pipe line off to a fast, sound start, we have reversed the usual practice for the building of an interruptible load. Instead of filling our valley after peaks had been established, we contracted for a special volume of interruptible to be available from the first. This has been sold. Now we are building peaks to fill an overflowing valley.

Also, we are operating in an area with an abundant supply of tax-subsidized electric power. Our market uses more electricity per household than any other in the United States. And oil has about 80 per cent of the house heating market.

At the present time, we have about 47,000 customers in a service area with a population of about 1,200,000. In 1955, we sold 26,500,000 therms of manufactured gas.

New natural gas rates, uniform for the entire service area are from 38 to 48 per cent less for house heating customers than former rates for manufactured gas. Reductions in other categories are also substantial. For the all-gas house, the end rate will be lower than any combination of competing services.

Tough Task Ahead

There is no short cut to this goal. We wish to add over 10,000 house heating customers per year. Our big job now is to go out and sell the builders and also the individual householding customers on a one by one basis. We have a product at a price that can be sold in a market with a high saturation of electric appliances and oil furnaces.

The house heating customer will provide the large volume loads, the peaks of balance the huge interruptible load, and an entrance into basements where we will establish our beach head for a future battle with electricity for appliance business upstairs. We expect to make a real impact upon the fronts held by electricity in about three years.

A large majority of western Washington householders have never used gas and have many erroneous ideas about the fuel that haven't been corrected, to say the least, by our competitors. We have a hard selling job to do, but not an impossible one.

New Home Market

Our first and most logical market is the new home construction field. About 8000 new homes are built each year in the Seattle area alone. At present, we are picking up most of the new construction within reach of our system.

As an experiment, we installed gas

distribution systems prior to construction in several housing developments. These tract jobs were remote from our existing system, but lay right along the route of our natural gas supply mains. Bottled gas was provided to these tracts from a tank farm until natural gas arrived and we could connect them to our system. Home buyers were given their choice of heating equipment and 88 per cent chose gas.

It is true that many of these buyers who chose gas were new residents who came from other parts of the nation where gas is already the preferred house heating fuel. But, by this means we have saved hundreds of accounts that otherwise would have been lost to competition. It has also helped tremendously to establish gas as the modern fuel.

Over the years, our number of customers declined while use per customer increased. As a result there were a large number of inactive services — 40,000 in Seattle alone. We have built up a large canvassing crew to concentrate on the reactivation of these services. Results have been encouraging.

Dealer Program Established

Prior to the natural gas era, company appliance sales floors were virtually the only outlets in communities served. A dealer contact division, established early in 1955, activated over 100 appliance and heating equipment dealers.

To prepare dealers, installers and retail appliance salesmen, we have established a series of training programs which have been enthusiastically received. All of our training classes have been enrolled to capacity, and we intend to continue the program indefinitely.

Strengthened Sales Department

In every area of activity we have been beefing up the sales department for the task ahead. A new industrial sales division was created which has already passed a major test in interruptible sales. It is now concentrating on firm sales to industry and large commercial establishments.

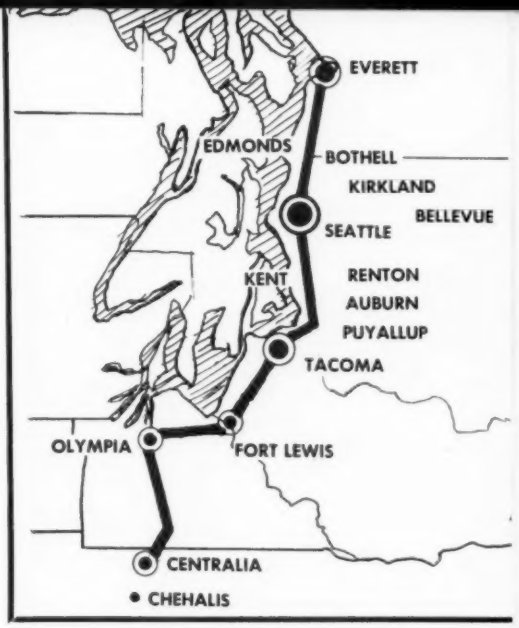
A new-construction sales division, serving architects, contractors and home builders, have secured agreements to install gas heat in over 2500 new homes. The number is growing daily and we're just getting started.

Among additions to our staff we have added a commercial cooking consultant to work with hotel and restaurant suppliers. Our home service department has been enlarged. New sales personnel have been added in all divisions and at all local offices.

In keeping with our greatly increased sales effort, our advertising and promotion budgets have been increased so that now we are running the heaviest schedule of advertising in our history. The program includes newspaper, radio, outdoor, car cards and other media in generous size and frequency. In a round of home shows, gas has uniformly dominated display space and the advertising and publicity in connection with them.

Apart from concrete sales results, which are on schedule and improving daily, we have another strong indication that our recent efforts are making an impression upon consumer consciousness: *Our competitors have intensified their advertising and promotion efforts far beyond anything they have ever done before the natural gas era.*

The battle is on.



Map shows area served by Washington Natural Gas.

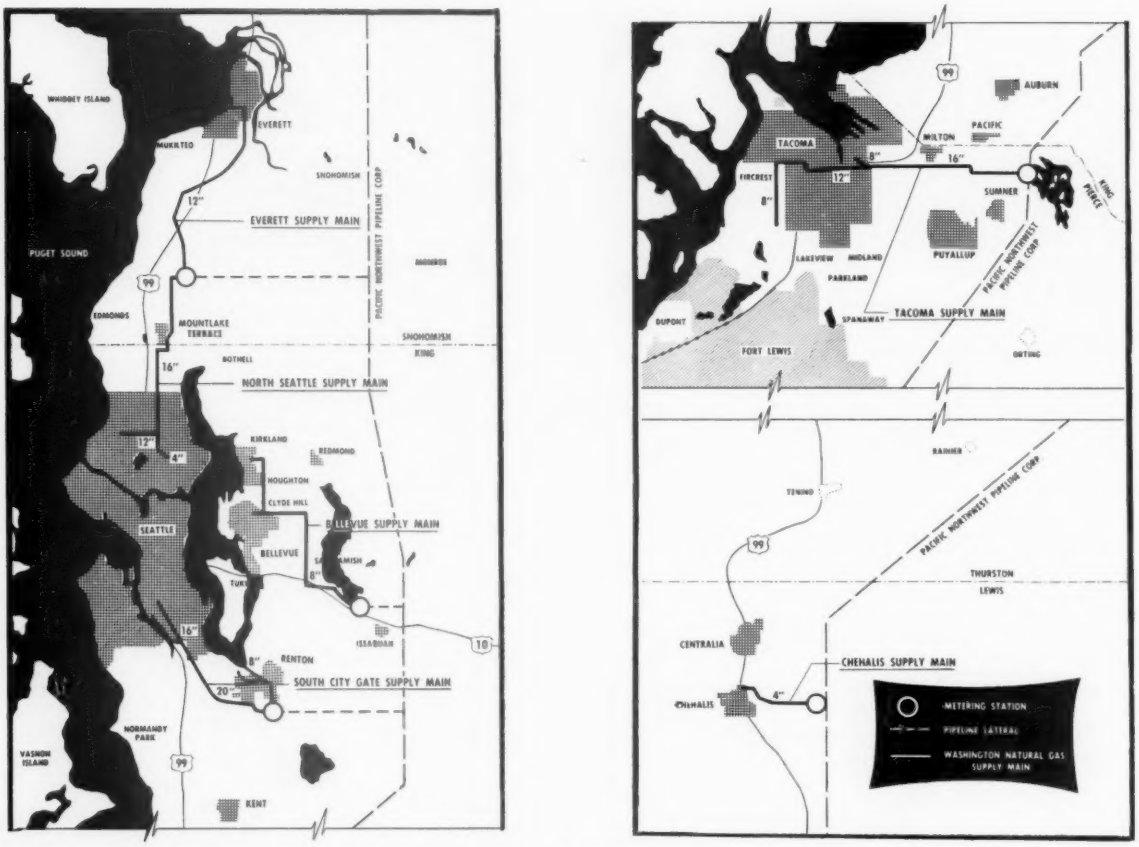
$30,000,000 Expansion by WNG Involves Complex Planning, Coordination

James F. Gary,
Superintendent of Engineering and Construction, Washington Natural Gas Company

WASHINGTON Natural Gas Company's plans for extensive enlargement of its existing facilities to receive and distribute natural gas have progressed well. Serving an area with an estimated population of 1,200,000 people, its service area comprises the Puget Sound region in the far Pacific Northwest in which the company holds franchises in some 30 towns and cities and has applications pending in several others.

The company serves approximately 50,000 users of whom 12,000 are heating customers. There are 5 plants producing gas of which the largest are located in Seattle and Tacoma. Smaller plants are located in the city of Everett and at Chehalis, Washington. There are some 1600 miles of distributing system, of which approximately 75 per cent is cast iron low pressure main and the remainder is all intermediate pressure steel main.

The principal plant located in Seattle serves approximately 80 per cent of the customers and manufactures an oil-gas of 540 Btu per cu ft, with a specific gravity ranging from .55 to .65. The Tacoma plant serving approximately 12,000 customers delivers a carborated water gas of 535 Btu and .60 specific gravity. The two smaller plants are delivering 1000 Btu propane-air. All systems are to be converted to straight natural gas.



Supply system map shows 1956 construction program. Bold lines are supply mains.

Anticipated Growth

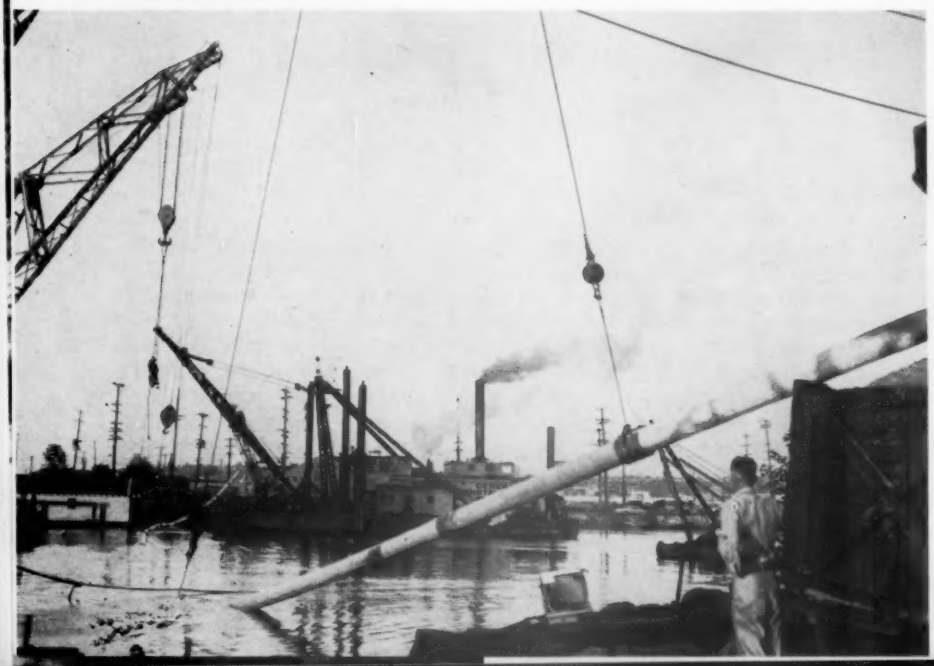
The company expects to build its business initially in the domestic heating and interruptible industrial loads. The five-year projection indicates that 7000 to 8000 heating customers will be added each year to the 12,000 now served. The company has signed contracts with interruptible industrial customers to use approximately 63,000,000 cu ft per day of natural gas. In three years, the company expects to be selling eight times the current annual thermal load.

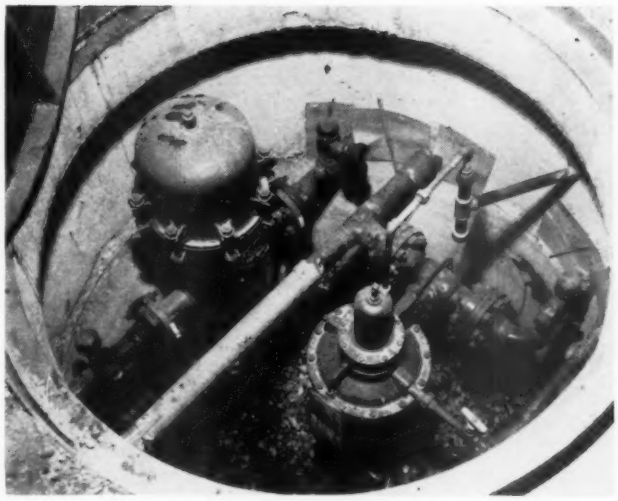
Obviously, a project of this scope requires a tremendous effort to adapt and expand existing distribution systems. The company has a $9,000,000 construction budget for the year 1956 and a five-year budget totaling approximately $30,000,000.

The company is performing all planning design work and supervision of

Street construction scene during installation of South Seattle supply system.

Spectacular construction project was installation of 525 ft of 12-in. pipe under Duwamish River in Seattle.





District regulator station installed in concrete vault.

Part of 75 miles of main laid from five city gate stations.

construction with its own forces. In 1956 estimated additions include the following items:

Distribution System, Main Services, Meters & Regulators	**$3,900,000**
Natural Gas Supply Mains and Appurtenances	**4,550,000**
Sectionalizing	**140,000**
Transportation, Production, Miscellaneous	**201,000**
Normal Replacements and Betterments	**225,000**
Total	**$9,016,000**

Construction Program

Construction work in the year 1956 includes the building of 75 miles of supply mains ranging up to 20-in. These will connect various cities of the system with the natural gas transmission line. Also included will be five city gate stations, 25 district regulator stations, 300 sectionalizing valves, 550 purge risers for the change over process, plus odorizers, foggers, humidifiers, dust filters, instrumentation and many miscellaneous items required for resolving complex changeover and operating problems.

Largest expenditures are programmed for the Seattle area. This area is unique in that the natural gas supply main will not be brought into the existing gas plant. This is due to the long hour glass shape of the city. It has produced a distribution system that is approximately 30 miles long on the north-south axis and roughly four miles wide, varying from two to six miles. The gas plant is at the center of the system and supply mains extend north and south through the heart of the area from the outside towards the center. This means that district regulators can be installed from the new supply mains and will serve the existing distribution system without having to take Natural Gas through the plant. A certain amount of the natural gas will go into the plant automatically through the existing distribution system and will be used for peak-shaving purposes.

New Industrial Mains

Industrial supply mains to be installed as part of the natural gas supply system comprise another 35 miles of main installations ranging in size from 4 to 12-in. Domestic and commercial mains and services will comprise another 250 miles of mains and services to be installed each year.

The largest percentage of growth is expected in the Tacoma system, in which there are only 10,000 customers in a population of approximately 170,000. Some 16,000,000 cu ft of industrial interruptible load has been contracted in this area and it is estimated that within the five year forecast period peak days in this area could reach 30,000,000 cu ft per day. This would be brought about by the addition of several large military installations, as well as 2000 domestic heating customers each year.

Two-City Connecting Main

An interesting feature of the Seattle system is the installation of a 15-mile, 12-in. connecting main so that joint billing from the pipe line company will result for the cities of Everett and Seattle. Everett, a city of some 35,000 people with 2000 customers, has an estimated third year load of 23,000,000 cu ft per day of industrial gas and 2,000,000 cu ft per day of domestic gas. This large interruptible industrial load coupled with the large domestic heating load available in the Seattle system will help give the company a high load factor.

Materials

Major part of the construction for the year consists of the supply laterals connecting the various cities to the pipe line. Pipe used by the company is all API 5L or 5LX-42 line pipe. All valves installed are lubricated plug valves.

Cold tar enamel with glass fiber and kraft paper wrappings has been applied to all pipe. Mill wrapping is being used in all cases. Pipe wall thicknesses range from .188 in the 6 and 8-in. sizes to .250 in the 12 and 16-in. sizes and .312 in the 20-in. size.

Design

All work is being designed and installed in accordance with the requirements of ASA code for Pressure Piping, ASA B31.1.8-1955 "Gas Transmission and Distribution Piping Systems" and with the requirements of the rules and regulations governing the construction of gas distribution systems set forth by the Washington State Public Service Commission.

Supply mains are designed for 300 psi operation. They are, however, sized for 125 psi operation and this pressure is not expected to be exceeded for at least a five year period. The 300 psi design will keep the hoop stress at less than 30 per cent of the minimum yield strength of the pipe. Construction is all of type C or better, as defined in the code.

Intermediate Pressure System

In designing distribution system expansion and in adapting existing distribution systems to serving natural gas, all loads have been estimated on a square mile basis. Intermediate pressure distribution systems have been sized for a 25 psi maximum and a 5 psi minimum pressure.

The ideal square mile pattern will consist of 6-in. mains usually in an east-west direction and spaced at one mile intervals when the area is fully developed. Two-inch mains will be laid

Trailer unit used in air testing mounts two compressors for flexibility.

One of the five city gate stations on WNG system. All are identical.

on the north-south streets. The pattern would shift, of course, depending on the way in which the streets were plotted. This system would become a grid work only when fully developed by customers. The 6-in. main would be eventually fed at two mile intervals along its length. With such a system, calculations show that up to 170,000 cu ft per hour could be distributed.

Due to modifications of this ideal pattern by various topographical features, 170 Mcf per hour is more than 100 per cent saturation for most residential square miles. Those square miles containing commercial development would require the use of more 4 and 6-in. main in place of 2-in. Company engineers feel that this particular design is practical in that it can be constructed in portions only as consumer demands make it necessary. At times, the 2-in. main would be gridded to correct pressure conditions where load growth is not in accordance with the ideal plan.

An initial distribution system development of 6-in. mains spaced at two mile intervals rather than one mile would supply a square mile of up to approximately 40 per cent saturation, leaving room for orderly plant development.

Low Pressure System

Low pressure systems are somewhat more complicated to evaluate. As a general statement, a low pressure system has no place in present day distribution design for natural gas heating loads. Existing systems, however, must be adapted to meet new consumer demands.

Using estimated square mile loads to be developed, company engineers have determined the locations for a number of district regulators to be installed. A maximum of 2.5-in. of pressure drop will be allowed across any part of the low pressure system. Due to the long, narrow shape of the Seattle distribution system, district regulators can be established from short laterals constructed from the supply system without undue cost. It is estimated that the existing low pressure distribution system in Seattle consisting of 900 miles of main can be used for many years in this manner for supplying domestic heating customers.

The company has developed a small district regulator station that has interesting features. It consists of a round pre-cast manhole section dropped into place on a crushed rock base. Most district regulators will be of 2-in. size. Four major regulating vaults in downtown areas using Reliance CBN regulators will be constructed. Filters will be installed upstream from all district regulators.

Unusual Construction Features

Construction involves the laying of mains through all of the usual areas found in metropolitan and adjacent areas. In swampy areas, some concrete coated pipe is being installed. Certain other areas, though swampy in the springtime when the design work was occuring, dried sufficiently in the summertime to permit the installation of well wrapped pipe, and anchors were then substituted for the concrete coating at a considerable saving of money.

The most spectacular construction problem was the installation of the 525-ft length of 12-in. pipe under the Duwamish River in Seattle. The project was located within the industrial area of Seattle in a commercial ship channel with docks, lumber mills, and other industrial establishments on each side. Construction was completed in 1955 to reinforce the industrial area distribution system so that several industrial concerns, that in the past had been denied service due to limitations on the distribution system, could be supplied with manufactured gas immediately.

Seamless API 5L line pipe with a wall thickness of .500-in. was used to cross under the river. The same pipe from other suppliers is being used for two other river crossings this year. These will be under the Puyallup River and the Stuck River, both of which must be crossed with the Tacoma supply main.

The horizontal distance between overbends on the Duwamish River crossing was 480 ft. The ship channel was 200 ft wide. The distance between pierhead lines was 400 ft. Fifteen feet of cover over the pipe below the channel bottom required the dredging of some 9000 cu yd of material.

Buoyancy calculations were based on providing 20 lb per lineal ft negative buoyancy in a mud fluid density of 90 lb per cu ft. This required slightly less than 2-in. of concrete coating around the pipe. All joints were X-rayed and the complete assembly was hydrostatically tested. Test cylinders of the concrete were sprayed from each mix for testing at 4, 7 and 28 day intervals. The four-day cylinders developed 5000 to 6500 psi compressive strength, well over the required 4000 psi.

Installing the pipe required considerable ingenuity. Pipe was welded on the river bank parallel to the river and shaped to fit the dredged ditch. At high tide, three floating cranes were moved in and three cranes on shore assisted raising the pipe and maneuvering it. The operation required that the pipe be moved from its position along the shore by pivoting one end on shore while swinging the other end through an arc of more than 90 degrees and moving downstream about 100 yd. Since the ends of the installed pipe would extend back into the banks, the shoreward end had to be maneuvered between power poles and back onto the street so that the outer end would clear docks on the far side of the river, while

being moved.

The operation attracted a great deal of local newspaper and television interest. The installation was performed by Engineers Limited Pipeline Company.

Cathodic Protection

Soil tests over the past several years indicated that a relatively mild soil condition exists throughout the Puget Sound region. There are, however, local areas that will destroy pipe walls within a relatively few years. No cathodic protection is being installed at the present time. All wrapped pipe is being used, however, and an insulating gasket is installed at each main line block valve and at all side valves.

Test leads and some anode leads are being installed on the pipe as it is laid. A program has been established for the periodic setting of instruments and the testing of the facilities to determine the need for cathodic protection. Magnesium anodes will be installed as required.

Testing

In general, air testing is being used. Hydrostatic testing is being used for the river crossing mains prior to their installation. Two large 500 cu ft compressors have been placed on a trailer. These are connected in series in such a way that a very simple attachment can be made to the test risers from the buried pipe. The trailer is readily towed from one location to the next, as needed to complete the testing program.

A 100-psi air test for leakage is first placed on a section of main. If this test is successful, or whenever leaks are repaired so that the test can be successful, the pressure is then raised for the strength test and to prove the integrity of the 300 psi design.

A dead weight gage is used for checking pressures and there must be no pressure loss for a 24 hour period for the main to be acceptable.

Welding

Welding inspectors hired by the company for the construction program visually inspect all welds as they are made. X-ray control is used and averages about 30 per cent of all welds. Casing wells, tie-in welds, and river crossing welds were all X-rayed 100 per cent. Through heavily populated metropolitan areas, the number of welds checked by X-ray will average 50 per cent or higher, depending on the area. In rural areas, the average drops off to about 15 per cent.

Sectionalizing

The changeover of customer appliances required that the widespread distribution system of the company be divided into 33 sections ranging up to 2000 customers per section. The valves used for sectionalizing are all lubricated plug valves with spigot ends cast as an integral part of the valve body. These valves were then inserted into the cast iron mains with dresser couplings. Very little sectionalizing was required on steel mains as valves had been installed over the years when the mains were constructed. The large number of dead end mains in the distribution system required the estimation of some 575 purge points. These were necessary so that the manufactured gas could be burned off at the time the section was changed to natural gas. Some 315 valves were required. Total cost for installing all valves and purge points is $140,000. This was done by a contractor under the supervision of company engineers.

Fogging and Humidifying

The changeover to natural gas has created serious problems for companies in other areas operating old cast iron distribution systems. In an effort to forestall some of these dust and leakage problems, the company is installing some fogging and humidifying equipment in areas where these troubles can be anticipated. A portable fogger has also been purchased so that it may be moved from point to point, if and when dust storms develop.

The Author

James F. Gary, Superintendent of Engineering and Construction, Washington Natural Gas Company, graduated from Haverford College in Philadelphia, Pennsylvania with a BS degree and worked for the DuPont Company before enlisting in the Army in 1942. He was in the Army paratroopers for four years, reaching the rank of captain. He went to work for the Seattle Gas Company in 1947 as a cadet engineer at the gas plant, and has since worked successively as pressure control foreman, assistant distribution engineer, distribution engineer. He is responsible for all company development planning, engineering, and the supervision of contractor construction.

Advance Planning Paid Off in Minimized Conversion Problems

David D. Risser,
Coordinator of Changeover, Washington Natural Gas Company

IF advance planning and meticulous attention to multitudinous detail can minimize the problems involved in the changeover of a distribution system to natural gas, Washington Natural Gas Company was well prepared for the arrival of natural gas in Western Washington.

After about eight months of "doing," there is a long string of red marks upon our long check list which was developed in over two years of planning.

In the planning, the company has been fortunate in being able to draw upon the experience of many other distribution companies over the nation who have already accomplished changeover. These plans were not, however, without improvisations based upon the local situation.

Studies of past changeover performances established a healthy respect for the complexity of the task. Changeover of the entire system has required two and a half months.

Washington Natural has been distributing manufactured gas to nearly 50,000 customers in an oblong area in western Washington embracing Everett in the north and Centralia in the south. Approximately 1,200,000 persons reside in this area, which contains about 80 per cent of the state's industry.

Seattle, the third largest city on the West Coast, and several suburban communities have been served by plants

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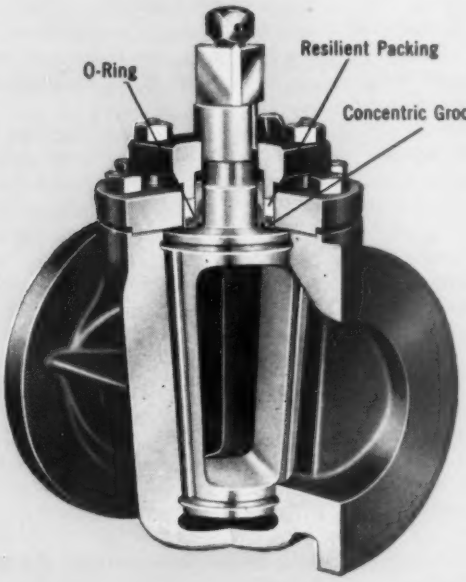

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Dispatch control center handled conversion day rush with ease.

producing a combination of high Btu, low Btu, and water gas with an average Btu rating of 540.

A water gas plant, located in Tacoma, served Olympia, Puyallup, Sumner, and Auburn, besides Tacoma. This gas has a Btu rating of 520. Everett has a butane-air plant and Centralia-Chehalis is served by a propane-air plant.

Natural gas, with a Btu rating of 1080 and a specific gravity of .62 will be distributed to all company customers.

The system was divided into sections with slightly less than 2000 customers per section. Centralia-Chehalis, Olympia, Everett, and Puyallup Valley were single sections. Tacoma was divided into seven sections, Seattle 23 sections.

Conversion In Two Days

With two exceptions, conversions were completed in two days in all sections, with a separate turn-in scheduled for each Monday, Wednesday and Friday.

For sectionalizing, 315 valves and 576 purge points were installed. Contractors installed all purge points and low pressure valves up to 16 inches. Gas company personnel installed all low pressure valves 16-in. and larger and all high pressure valves.

Turn-in operations were handled entirely by Washington Natural personnel under the coordination of Paul Hougland, distribution engineer. Turn-in was done by two-man crews with a crew chief for about each four crews. Crew chiefs were equipped with two-way short wave radios.

Sixty men were required for average sections, but as many as 110 men were required for larger sections. An estimated one hour was required for the completion of section purging, with a 6 a. m. deadline. The conversion contractors, Conversions and Surveys, Inc., took over at 7 a. m. for conversion of appliances.

E. W. Campbell, job superintendent for Conversions and Surveys, reported last November and, with a limited force, completed appliance surveys in a period from December to April inclusive. The study involved 100 per cent surveys of heating appliances, commercial and industrial establishments, and oil burner pilots. Only a cross-section domestic survey was taken, to serve as a guide for ordering of parts.

It was found that the WNG system had an unusually high saturation of oil burner pilots; over 4000 to be converted at company expense. The quality of domestic equipment is unusually high, probably because communities of the area are comparatively young.

As is customary, the conversion force included specialists for industrial, commercial, laboratory, oil burner pilot, and refrigerator work. Because of high saturation of space heating customers, it was necessary to train domestic men to be house heating specialists as well. One section of 1600 users had 1100 house heating customers.

Full Publicity Given Program

A public information program was launched with a series of meetings with various officials and department heads of 11 municipalities served by the company. Changeover plans were outlined for mayors, councilmen, police and fire chiefs, and city engineers. Several meetings were given full coverage in the press and the response was generally excellent. The company is continuing to supply city officials with current information, maps and samples of changeover literature.

To educate employees, a booklet was prepared that answered every anticipated question that might be asked of employees. Orientation meetings, ranging from two hours to two days of instruction depending upon the amount of department involvement in the program, were conducted for all employees. Sixty men from the production department were given a two-week course is gas utilization and appliance conversion so that they might be qualified for transfer to the distribution department.

Nine different tags for appliance posting during conversion were developed and 10 public information pieces, from letters to two-color printed brochures, were produced and more are on the way. Two new innovations in this area have been prepared. Red adhesive tape with the words, "Do Not Use Oven" for sealing oven doors were used. Also new was a printed "card of introduction" for use by conversion men in lieu of a letter, which outlines conversion plans and gives prominent display to the telephone number of a special changeover information center.

All conversion calls were channeled to an information center, housed in the same building as the conversion contractor. It is manned by 12 especially trained girls, all college graduates. Some of the girls followed the conversion work to all cities in the area.

Conversion, Order, and Record cards, (COR) the basic order of conversion, were prepared for each of the company's customers on IBM equipment. At the time the COR cards were run, IBM carbon copies of the name and address were printed on delivery tickets. Instead of mailing certain information broadsides, the delivery cards enabled hand delivery of such material through the use of a messenger service.

Broadsides were delivered a week ahead of conversion and again 48 hours before. Because of low saturation of gas customers, broadsides were delivered only to gas customers on record instead of to every house as is the usual practice.

Ads Map Conversion Progress

Full page daily newspaper ads, scheduled to coincide with the start of conversion in each city, included maps and much specific information. Quarter-page ads ran ahead of each section turn-in, pin-pointing customer instruction to a greater degree. Community weekly ads were run one publication date ahead of local turn-in schedules. Television was not used and radio was in the plans on a contingency basis only. A maximum publicity effort was made at the same time.

The author checks over last minute plans.

Load Building Sales Campaign Sizzled To Successful End on Deadline Day

ON June 30, Washington Natural Gas Company put a smasheroo ending on a sales story that may be one of the most dramatic in the history of the gas industry.

Facing a July 1 forfeiture deadline in a contract with Pacific Northwest Pipeline Corporation for 58,000,000 cu ft of special interruptible load, the distributing company went into the final week of a four-month campaign with industrial contracts representing less than half of the goal.

The entire management team and the sales department mustered all of its strength for a final push. At week's end, the tally sheet read like this:

Contracts signed — 56

Total volume — 63,640,000 cu ft on a maximum day basis

Theoretical oversale — 5,640,000 cu ft per day.

But these hot statistics fail to capture the drama of that monumental sprint to the finish.

The campaign began late in February when Washington Natural announced proposed rates. Proposed contracts, based on surveys taken earlier, were presented to more than 60 industrial firms of the area, from Everett in the north to Chehalis in the south.

Prospects were contacted frequently by industrial salesmen under the direction of Norbert O. Fratt, vice president in charge of sales, and Robert L. Beardsley and Stan Winter, division industrial sales managers. Prospects seemed to be sold, but for every cubic foot in the proposed contract, there was an excuse for delaying the signing. Although the deadline was real, it was difficult to convince prospects that it was not company imposed device for signing customers.

Tension mounted during the month of June. Toward the end, Walter S. Byrne, president, Charles M. Sturkey, executive vice president and general manager, B. T. Poor, southern division vice president, and others of the management staff joined the battle.

Each morning, while prospects were at breakfast, the sales force rallied for strategy conferences. Fratt reminded his men of the millions per day left to get. Then it became millions per hour.

In the final week, prospects began to respond to Washington Natural's increasing pressure. There was no time left to exchange contracts through the mails. Legal representatives of customer companies were almost literally hauled into conferences. Any special terms of the contracts were written into legalities on the spot and the contracts were signed then and there.

If Washington Natural's last week effort to sell 30,000,000 cu ft seemed tough, it seemed even less likely that the campaign would overshoot its goal — but it did, by 5,640,000 cu ft per day.

Many of the last minute contracts were large and there wasn't time to be fussy about the exact total amount of gas available under the interruptible contract with the pipe line company.

Although no more interruptible gas is available from Pacific Northwest Pipeline Corporation, Sturkey announced that the additional gas sold could be accommodated through use of the company's valley mats firm gas supply.

On the basis of 70 per cent availability, the interruptible sales will result in more than $17,500,000 in gross revenue over a five year period and will amount to more than 16 billion cubic feet annually or about six times Washington Natural's total system maximum demand of 1955.

For Norbert O. Fratt, who has known the thrill of collegiate football victory as a player, and the kicks of boating a 50-lb king salmon in Puget Sound as an enthusiastic sportsman, the interruptible sales success is an especially gratifying triumph. However, it increases an already large job for the months ahead.

Instead of the usual practice, whereby a distributing company sells interruptible gas in the valley after peaks have been built up, the gas industry in the Northwest is reversing the process. In order to get the pipe line off to a fast start, special interruptible volumes were made available from the first. Peaks must be built to fit.

Now that Washington Natural has filled a king-sized valley, Fratt looks up at those peaks on a load chart that resemble a Mount Rainer with "100 per cent load factor" written in the snow at the top. Electricity and oil, already well established in the market, will not make climbing easier.

"About three years ago," said Fratt, "I made a trip around the country to study the sales performances of other companies that had changed over to natural gas.

"Don't worry," the boys told me, "you'll fill your valley over a period of years as industry learns the advantages of natural gas.

"We had no choice to do it that way if we'd wanted to."

Over The Top. Three months before gas was to arrive, WNG was "all sold out." Elated officials signing 56 five-year contracts are, l to r, Charles M. Sturkey, Norbert O. Fratt, and Robert L. Beardsley, industrial sales manager.

At the present time, Washington Natural is engaged in an aggressive sales campaign to build peaks as high as possible. Emphasis is being put on space heating for which rates are advantageous.

"Our original estimate for a winter peak day after five years was about 40,000,000 cu ft. Obviously, we'll have to sell much more than that to balance the interruptible load," Fratt said.

Arrival of Canadian natural gas in late 1957 will increase the number of days service to interruptible customers, but it will not make more interruptible gas available on a daily demand basis unless winter heating loads justify it. Fratt said.

Wood products industries will use about a third of the interruptible gas. The largest contracts in this category are for three Everett plants — Scott Paper Company, Simpson Paper Company, and Weyerhaeuser's sulfate mill. St. Regis and West-Tacoma Newsprint Company are other large users.

Metal processors will use large amounts of natural gas including Boeing Aircraft, Bethlemen-Pacific Coast Steel, Pacific Car and Foundry, American Can, and Northwest Lead companies.

Food processors rank third among large gas users, including meat packers, bakeries, dairies, and related industries. Ceramics concerns, glass manufacturers, laundries, gypsum plants, hospitals, schools, and other large institutions also signed contracts.

Washington Natural's largest interruptible customer in the Tacoma area will be Hooker Electro-Chemical Company.

Most of the interruptible gas will be used by industry to generate steam used in processing, but it will also be used in various kilns and heat treating equipment.

Except for the use of gas for drying plywood, the wood products industry will use natural gas almost entirely for steam generation.

New Gas Fired Method For Drying Plywood Significant Development

UP to 160,000 cu ft of natural gas per day will be used by Rainier Plywood Company at Tacoma, primarily for a newly perfected direct-flame, gas-fired veneer dryer, that has doubled the company's production capacity in a year of experimental operation with propane gas, and which may have far-reaching significance to both the plywood and natural gas industries.

The increase in production has been realized with reduced costs, even with relatively expensive propane gas, and natural gas, used on an interruptible basis, will result in substantial further economics, said George F. Baum, president of Rainier Plywood.

Controllability of high temperatures using gas produces veneer that can be glued with highly satisfactory results and made possible a switch by the firm from interior plywood to high quality exterior plywood in July.

Technical consultants to Rainier Plywood estimate that other plywood plants of the Northwest could increase production about 20 per cent with the new drying technique and predicts most of them will convert to natural gas.

In addition to savings and production increases, the new drying method will open a whole new avenue of wood utilization for the plywood industry because higher, better-controlled drying temperature will make possible the economic production of plywood from hemlock.

The Rainier plant's unique dryer installation, the first standard-length gas-fired unit in the Northwest, has been "tremendously successful."

Not a single fire has been reported in the dryer in over a year, a remarkable record, and it has eliminated dirt and the cost of keeping the dryer clean. A gain in heat has been realized because the direct gas flame burns volatiles released from the material.

Rainier completely piped its plant for gas over a year ago in anticipation of natural gas and has been using propane from an 18,000-gal tank. As Rainier plywood will use natural gas on an interruptible basis, the company will install a propane-air unit for standby purposes. Rainier also has installed an additional hot press to double the plant's pressing capacity.

The gas-fired dryer, which has become a show-piece for the Northwest's plywood industry, was engineered and equipped with electronic controls by Heat and Controls, Inc., a conversion firm with headquarters in San Francisco.

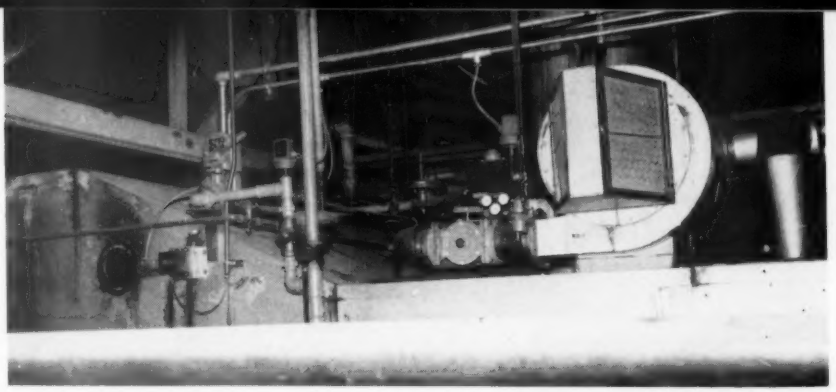
The drying of veneer, from which plywood is made, has been the bottleneck of the plywood industry. Until

Gas fired dryer produces better grade of veneer for plywood manufacture.

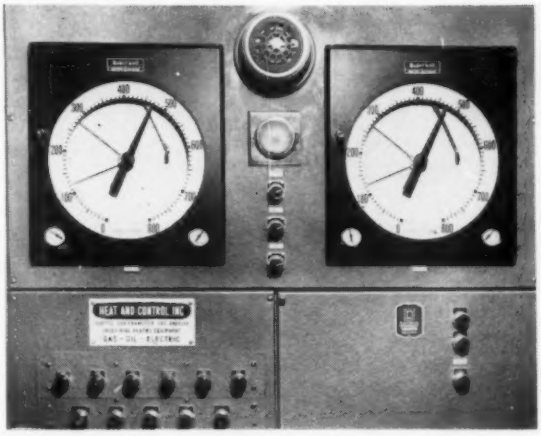
this new gas-fired technique was perfected, the industry has been dependent upon steam for drying and was limited by steam temperatures, produced by burning wood wastes. Steam, when charged with all generation expenses is relatively expensive. Wood wastes formerly used for heat have become valuable for paper and hardboard production. Frequently, costly fires occur in steam dryers.

American Marietta, industrial materials firm, which supplies glue to Rainier, has conducted continuing mill and laboratory studies to "prove out" the new drying process and has found it successful on all counts.

The direct-flame gas dryer is considered to be a significant contribution to the plywood industry, according to H. M. Preusser, technical service manager for American Marietta. Hemlock is a good, abundant Northwest wood, but drying it has always been a problem because it reduces the drying unit's capacity. Because gas permits higher, better-controlled temperatures, it will be possible to obtain mill production capacity for hemlock comparable to Douglas fir.



Gas-air mixing unit atop gas field dryer.



Electronic control panel maintains constant temperature for consistent product.

The Tree House That Changed A Pipe Line

A 10-year-old Seattle boy and his pals are convinced that gas company engineers are really nice people.

The lad and three of his neighborhood pals had labored most of the summer building a tree house near their homes. Then came word that a 20-in. gas main being constructed by Washington Natural Gas was slated to go directly through the middle of a double tree that held up one side of the boy's tree house.

James Van Meter, field engineer for Washington Natural, heard about the boys' plight. Remembering his boyhood days and the joys of treehouses and all the fun and daydreams that went with them, Van Meter quickly redrew the pipe line plans, diverting the new 20-in. main four feet west of where it originally was to be laid.

The youth watched in amazement as the ditch bypassed his dream home in the sky, leaving it intact. When the pipe was laid, he dashed over to the construction and shook hands with the first workman in sight. Then he climbed up the tree steps, surveyed the landscape with a happy grin, sat down in his bos'n's chair (apparently made from an old rocker attached to a cable), rode it down to another tree and ran home (next door) to tell his mother.

Folks from the gas company, it seems, are human, too.

Story courtesy,
—Seattle Post-Intelligencer

Ten-year-old David Harris, in his tree house, waves to Harold Elmendorff of WNG construction crew. Line was moved four feet to the left to avoid David's "house."

The Men Who Are Guiding Washington Natural Gas

W. S. Byrne

C. M. Sturkey

N. O. Fratt

R. D. Smith

B. T. Poor

Walter S. Byrne, President of Washington Natural Gas Company, attended Baltimore Polytechnic Institute, the University of Nebraska, and Iowa State College, receiving degrees in engineering. He was with Nebraska Power Company for 15 years as engineer, industrial engineer, sales manager, and assistant general manager. He joined Metropolitan Utilities District in Omaha, Nebraska, serving as chief executive officer for 15 years, retiring in June, 1954. He directed the changeover from manufactured to natural gas for Metropolitan Utilities District, and later served as consultant to two other utilities during their conversion. He was elected to the board of directors of Seattle Gas Company in 1954, and was elected president of Washington Natural on March 15, 1955.

Charles M. Sturkey, Executive Vice President and General Manager, graduated from Howard College with a degree in engineering. He is a former vice president of Atlantic Gas Corporation, Pennsylvania and Southern Gas Company, and Great Lakes Utility Company. He was formerly president of North Carolina Gas Company, Ohio Gas Light and Coke Company, Gas Transmission Corporation of Michigan, and The Gas Corporation of Michigan. Widely experienced in both natural and manufactured gas operations, he directed the conversion from manufactured to natural gas at Greenville, Michigan, and in seven northwestern Ohio cities. He was elected vice president and general manager of Seattle Gas Company in 1943 and assumed his present position in 1955.

Norbert O. Fratt, Vice President in Charge of Sales, has been in the Pacific Northwest since July, 1928, when he joined the Seattle Gas Company. He was elected a director of Seattle Gas in 1944. In 1943 he was elected vice president in charges of sales. He is a graduate of Lawrenceville School and received a degree in marketing from Cornell University.

Richard D. Smith, Treasurer of Washington Natural Gas Company, is a graduate of the University of Washington, where he received a degree in accounting. He joined Seattle Gas Company in November, 1930. He was elected assistant treasurer in July, 1946, and was named treasurer of that company in July, 1947.

Bernard T. Poor, Vice President and Southern Division Manager, is a graduate of University of Maine, receiving a degree in engineering. With Stone and Webster Service Corporation from 1927 to 1929, he joined Haverill Gas Company in 1929 and spent 21 years with New England gas and electric utilities. He returned to Stone and Webster in 1950, and in August, 1953, was named vice president of Washington Gas and Electric Company. He was named to his present post in November, 1955.

Gas and Jet Bombers

Natural gas will be used for a variety of purposes in Boeing Airplane Company's Seattle plant, where giant aircraft vital to the nation's air defense are built.

In Portland, Customers Are Eager For Gas

Charles R. Holloway, Jr.
Vice President in Charge of Marketing
Portland Gas & Coke Company

CEREMONIES on August 16 marked completion of the tie-in between the distribution system of Portland Gas & Coke Company and the natural gas pipe line of Pacific Northwest Pipeline Corporation, which will assure a supply of long-awaited natural gas for the industrial, commercial and residential users in Gasco's 475 square mile service domain.

In anticipation of this event more than $650,000 has been spent or will be spent in the current year to educate the public to the advantages of natural gas in all its usable forms.

What has been the result of this effort which has been coupled with the tremendous publicity the pipe line company has enjoyed, and that engendered by the Portland Gas & Coke Company as its conversion takes place?

Big Industrial Load

Because it is most spectacular, both volume and end use, the industrial load may be examined first. Currently, a dozen firms have signed contracts with Gasco that call for the delivery of 416,000 therms maximum per day. They will receive an estimated 71,000,000 therms during 1957 — 40 per cent more gas than was consumed by all of Gasco's 80,000 customers last year.

The huge Crown Zellerbach operations in West Linn, Oregon, and Camas, Washington, will use approximately 200,000 therms per day. Their consumption will include both straight boiler load and lime kilns, the products of which go into the manufacture of paper. This plant is the largest manufacturer of specialty paper in the world.

The Owens-Illinois Glass Manufacturing plant is a new industry on Portland Gas & Coke's lines. The plant, first of its type in the Northwest, was located in this area because of the availability of low-cost natural gas. Owens-Illinois will use a maximum of 15,000 therms daily. Use will include two melting furnaces, six feeders and seven lehrs, all used in the production of glass.

The Oregon-Portland Cement Company's plant at Oswego, Oregon, is now in the process of converting a major portion of its present equipment to the use of natural gas. The plant is also adding 25 per cent to its capacity and the new facility will have equipment designed for either gas or oil firing. Approximately 80,000 maximum therms per day will be consumed in the operation of this plant. The bulk of natural gas will be used for steam boilers and firing lime kilns.

More recently signed was Aluminum Company of America for one of its largest smelting and fabricating operations just west of Vancouver, Washington. This integrated plant will use interruptible gas next year on a basis of 35,000 therms per maximum day.

Two quite divergent new accounts are Great Western Malting Company in Vancouver and Portland Woolen Mills. The latter is the first of several industrial customers expected in North Portland.

Many other firms are considering natural gas for interruptible usage. In addition, attractive proposals have been made to firm industrial users and others who fall into a strictly seasonal classification.

Commercial Customers

The commercial field shows immediate response to the advent of natural gas. More than 400 accounts in this category have been added during the last 11 months in anticipation of the new fuel. Commercial cooking, water heating, and space heating have developed far beyond our expectations. The backlog of orders for commercial usage is also gratifying as much of the cooking potential which, in this subsidized hydro-electric stronghold, has been largely electric, begins to shift back to the flexibility of natural gas operation.

Domestic Customers

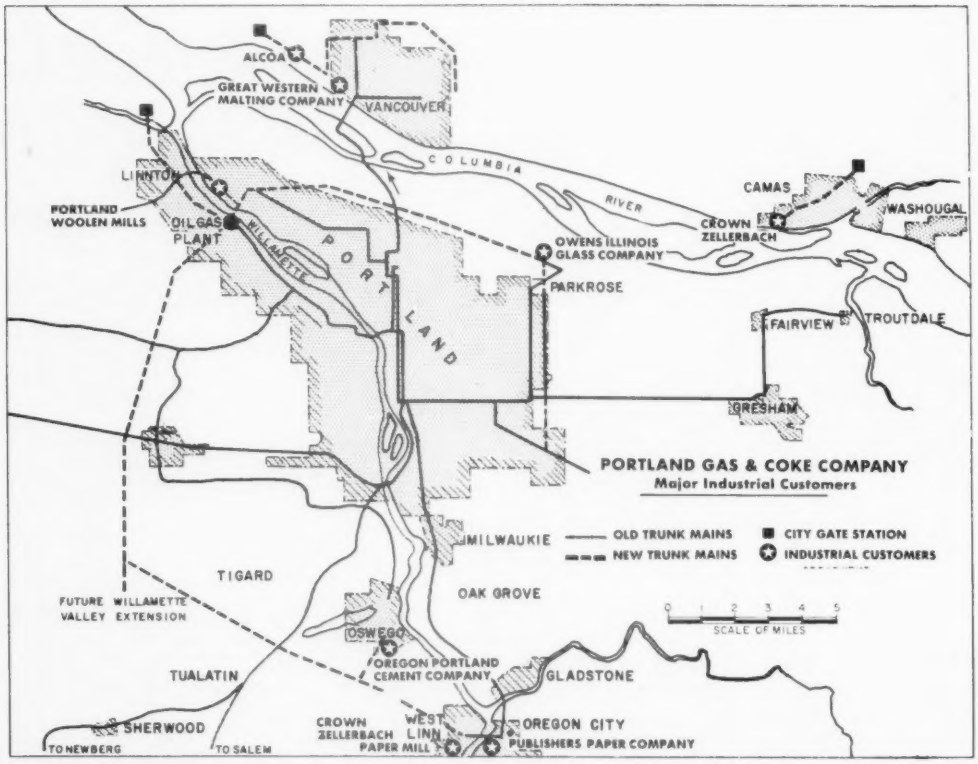
Domestic use, next to industrial, offers the greatest potential for load building, and space heating is, of course, essential to an orderly development of the load pattern.

Here in this marketing territory, with a freeze imposed by the company on the installations of further gas heating accounts, an unprecedented number of new homes constructed in the last 10 years, and an aggressive oil heat industry, we have faced a problem in translating the advantages and benefits of natural gas to the minds of the potential domestic users.

Approximately 68 per cent of the homes in this area are heated by a liquid fuel. Many of the liquid fuel installations are less than 10 years old, and, although the home owner in that class is receptive to the ultimate use of natural gas, he is not yet ready to convert a still usable unit to one burning natural gas. This applies primarily to the customer who has a central heating plant.

Natural gas meeting held in May attracted more than 700 dealers. Gasco's $1,700,000 rate reduction with natural gas was the surprise announcement.

Natural gas also dominated the 1956 Portland Home Show with 35 exhibits by gas appliance dealers in addition to Gasco's booth.

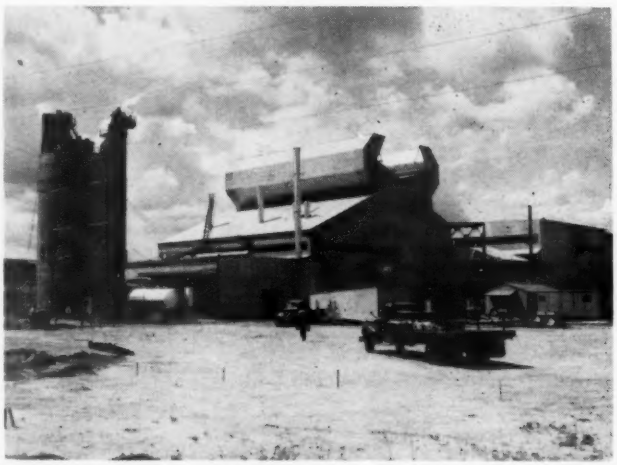


Major industrial customers served by PG&C are shown on map.

The circulating heater market is an entirely different story. Not only is the potential natural gas user excited about his actual savings on heating costs, but he is impressed with the cleanliness, dependability, and safety of the product.

In an effort to more accurately assess the immediate market for natural gas in home heating, we have conducted a broad, door-to-door survey campaign, asking the simple question, "Are you interested in using natural gas for heating?" Eighteen specially trained college students have been, since July 1, covering every sales territory in the Portland area. By July 27 they had talked to some 12,000 homeowners, of whom about one quarter have allowed the representative to make a heating survey.

The surveys are referred to a residential salesman of the Portland Gas & Coke Company who proceeds to authenticate



Owens-Illinois Glass Company plant, first in Northwest, uses natural gas to make a wide variety of glass bottles and jars.

the prospect. The prospect is then turned over to a heating dealer for the ultimate sale.

Portland Gas & Coke Company is committed to a dealer sales program. Although we do maintain a sales floor and sell all merchandise except central heating plants, we are endeavoring to place greatest emphasis upon dealer sales. Constant dealer salesmen training courses are maintained and all of our advertising points to dealer promotion.

The public is aware of the coming of natural gas. In this highly electrified area, dealers are aware that profits will come from sales of gas appliances. As the public increases its demand for gas, the dealers will more and more support our intensive promotion program.

The coming of natural gas to the Northwest and particularly to that area served by Portland Gas & Coke, heralds a huge expansion for the company. In addition to the many millions of dollars represented by actual construction expense, conversion expense, and expansion expense, are the millions of dollars being poured into our economy by manufacturers, distributors, and dealers to acquaint the public with the benefits it may receive with this wonder fuel.

Largest industrial account signed up for natural gas from PG&C is Crown Zellerbach's paper mill at Camas, Washington, about 14 miles upriver on the Columbia from Portland.

Mobile workshop (outside and in) used on conversion work Predrilling on some of larger burner units was one of many tasks performed in "converted" bus.

PG&C Conversion Plans Began Three Years Ahead of Gas

E. D. Rowan
Natural Gas Coordinator
Portland Gas & Coke Company

Map shows roughly PG&C's system, which serves 83 communities and 80,000 customers.

LONG before that important date, June 16, 1954, when the decision by the Federal Power Commission was laid down as to whom would be granted the permit to build the pipe line into the great Northwest, Portland Gas & Coke Company had begun its conversion plans. The company seriously started its conversion planning in the summer months of 1953.

Portland Gas & Coke Company has a widely scattered service area. It has five times the area and one tenth the number of customers of Brooklyn, New York, where the world's largest conversion to natural gas was made. It is estimated that the company's 80,000 customers will involve conversion of approximately 250,000 appliances with over 1,000,000 burners.

The system in the Portland area was divided into 43 sections, most of which contain approximately 2000 customers and required two days to convert. Eight were one-day sections, each containing about 1000 customers. The plan was to convert 1000 customers per day with a working force of some 400 men. Under these conditions it took about 93 conversion days, or 3½ calendar months, to complete the conversion.

Gasco's conversion problem was further complicated by the fact that 9000 of its customers are served from a single distribution line that extends 90 miles into the Willamette Valley. These customers cannot be sectionalized and supplied alternately with nat-

C&S man drills port openings on burner of water heater, typical of thousands in territory of PG&C.

ural gas or oil-gas since the distances and cost involved in laying a new large natural gas feeder main are too great. Natural gas was initially scheduled for arrival on August 1, but with this arrival date changed to September 4, it was planned to do the Willamette Valley conversion on a substitute gas. This was done by enriching the existing 630 Btu oil-gas with a 2200 Btu butane-air gas at a rate of 7 per cent for the first step and approximately 35 per cent for the second step gas. The mixture was made and introduced along with the oil-gas into the inlet to a 3,000,000 cu ft holder and pumped in the normal manner 90 miles to the end of the system. A third air adjustment call will be made after natural gas is turned into the Valley system. By proceeding in this manner, the conversion manpower geared for the August 1 date was kept on the job and working, and the conversion time lost because of the later arrival date was made up.

As a further move against delay in the arrival of natural gas, several sections in the Portland area were converted on the second step gas by isolating individual sections.

Approximately 180,000 gal of butane were used between the August 6 starting date and arrival of natural gas on September 1, 1956.

Specialized Conversion Firm Hired

Because of its fine reputation and vast experience in the conversion field, Conversions & Surveys, Inc., a subsidiary of Stone and Webster, was selected by Gasco to do the conversion work on its system. As early as March, 1954, a contract for the appliance conversion had been signed with this company. In July, 1955, a Conversion & Surveys utilization man was hired to assist Gasco's utilization staff in working out the numerous problems of conversion.

In the fall of 1953, a conversion planning section was set up within the company to work both on natural gas planning and the conversion problem. The conversion organization consists of the coordinator, his assistant and a staff engineer. The coordinator is, in the line organizations, directly responsible to the executive vice president of the company.

A "Tank Car" of Natural Gas

Fully realizing the importance of testing appliances on natural gas, the company began negotiations as early as March, 1954, to obtain a representative sample of natural gas for testing purposes. As a considerable quantity was needed for the year or two ahead, it was decided to try to fill a propane railroad tank car with natural gas. Considerable time and effort were spent in obtaining permission to transport this car of natural gas on the railroad. A special permit was required from the Bureau of Explosives to transport it from the point of loading at Pacific Gas & Electric Company's gas facilities at Davis, California, to Portland, Oregon.

After considerable time, all the necessary documents were completed and the gas was received at Gasco's plant, where it was transferred into an abandoned steam accumulator tank, ideally suited for the purpose as it had a designed pressure of over 200 lb. To complete its testing program, Gasco has since obtained two additional supplies of gas in this manner — one in July, 1955, from Los Angeles and another in June, 1956, from San Francisco.

Utilization Problems

One of the major problems in the Portland conversion was the existence on the company's lines or a large number of luminous flame heating burners. Approximately 6500 of Zink, Johnson, Payne and Kleenair models were found installed. Since these burners could not be adjusted to work properly on natural gas, a special "upshot" burner was designed and built by a local manufacturer to replace them.

On March 1, 1956, the street gas was raised from 570 Btu to 630 Btu by enriching the low Btu gas with high Btu oil-gas. The raise in Btu and gravity of the gas resulted in the same orifice factor, but lowered the hydrogen content of the gas to approximately 25 per cent. This lower hydrogen content enabled the Conversions & Surveys heating men to replace the majority of the luminous burners by July 1, 1956. It was necessary to replace or install safety pilots, filters, and regulators on many of the antiquated or early models of gas heating equipment, due to the different burning characteristics and narrower pressure limitations of the natural gas.

The oil-gas manufactured by Portland Gas & Coke since 1906 is considered one of the fastest burning of manufactured gases. This is due to its having a hydrogen content of over 50 per cent.

This snappy burning gas has worked to Gasco's disadvantage, however, because practically all commercial equipment, space heating burners, and do-

Last Minute Conversion News

Natural gas was turned into the distribution system of Portland Gas & Coke Company at 6 a.m. September 1, within hours of the August timing long promised by Pacific Northwest Pipeline Corporation. First gas was from new fields in Wyoming, and by the end of the month the fuel was flowing from the new pipe line's major source, the San Juan Basin in northern New Mexico and southern Colorado.

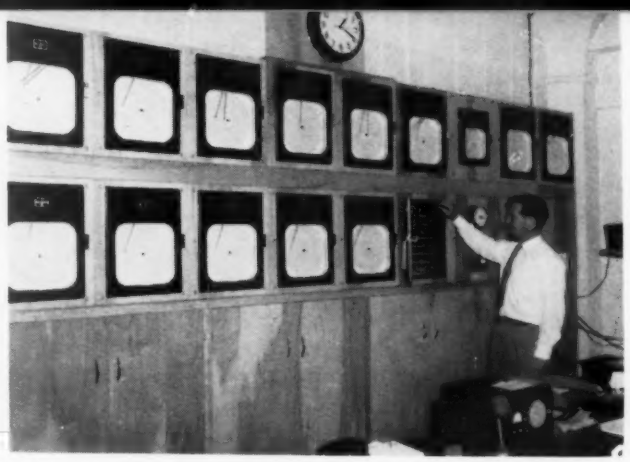
First Northwest customers to receive natural gas were more than 10,000 users in the Willamette Valley south of Portland, where a three-week conversion program had been completed a few days earlier. Their appliance changeover is believed to have been the largest yet made on a step procedure, rather than by sectionalizing. And it is believed to have been the first involving use of butane.

Butane-air mix was used to step up PG&C's manufactured gas in two stages to a heat content of 1170 Btu per cubic foot. The step conversion, which includes numerous scattered communities in six counties, was completed without serious incident by Conversions & Surveys, Inc.

Turn-on of natural gas in the valley resulted in far fewer service calls than were expected. Two of the 43 sections in Portland had been converted just before arrival of the new fuel, by using the same interim gas. These 3500 or more customers received natural gas on Labor Day, along with the first big industrial account, Owens-Illinois Glass.

After that date, all further conversion work has been performed directly on natural gas.

Sectionalizing valve is placed in typical main in Portland residential area.



One of two new pressure recording panels installed at enlarged dispatching center.

mestic range oven burners on its lines have become extremely hard, due to a carburization process in which the flame propagation takes place almost within the burner port. A special carbide reamer with a flexible shank was designed to drill burner ports without dulling or breaking the drill. Due to an interruption in the supply of these special reamers, however, it was necessary to use over 30,000 No. 35DS drills on the pre-drilling of only a small percentage of the total burners.

Early in 1954, a complete appliance test laboratory was set up in order to experiment with as many representative gas appliances as time allowed.

In early December, 1955, a headquarters for Conversions & Surveys' staff organization was set up. A building of 6000 sq ft was rented for their use ideally located geographically within the Portland area and suitable for both office and shop space.

Sectionalization

Sectionalizing of the company's system within the Portland area was a time-consuming and arduous problem. The distribution system is composed of a low-pressure cast-iron grid in the central downtown and east side sections of the city with a high-pressure steel system around the periphery of the low-pressure system.

Normal flow of gas into the low-pressure system is from the holder storage located about central to the area. The high-pressure system is fed through a small number of main feeder lines to the outlying areas. Maximum use of natural boundaries, such as the river which splits the city and a ravine traveling eastward, was made in the sectionalizing program. The most difficult problem was to devise a method to maintain the oil-gas feed into the area and at the same time bring natural gas to a section for the subsequent conversion.

The company, in its expansion program to serve more customers with natural gas, provided two large feeder mains that surround the city on the north and on the west, and these will feed natural gas for the sectionalizing and conversion program.

After many months of counting customers, juggling boundaries, and revising the feed locations, the sectionalizing of the Portland system was accomplished. Nearly 550 valves were required to carve out the necessary 43 sections. These valves range in size from 4 to 24 in., with most being of the plug type under 10 in. in size on the low-pressure system. All high pressure valves are plug type valves.

With these valves installed, it was necessary to operate only a certain group of valves around the boundary of a section at the proper time and in the proper sequence to introduce the new gas into a given section on the actual day of conversion.

All purging was scheduled to be completed by 7:00 a. m. on the morning of the turn-in of natural gas.

Turn-In On Conversion Day

The turn-in of natural gas was done with the normal radio equipped distribution vehicles and men at all valves and purge points. With the use of the tight and positive closing plug valve, it was possible to pre-close the night before certain 4-in. valves on the low-pressure grid section boundaries. This kept the number of turn-in crews reporting at 4:00 a. m. for valve operation to an efficient minimum.

A field bus, purchased earlier, was equipped with the necessary maps, radio, telephones, etc., for a complete field turn-in headquarters. Arrangements were made for locating it on public or private property as the conversion scheduled progressed through the Portland area.

Customer Education

A very extensive program of educating the customer on the conversion was undertaken as early as possible. This consisted of maps, newspaper ads, radio and television spots, together with a brochure, a postcard and a handbill to be sent to each service address.

Customer Service

A special room was assigned for all telephone contacts with the customer regarding conversion. This unit was set up early in January, 1956, to process the conversion order records (COR's) which were printed from the master IBM cards. In this Information Center will be twelve to fifteen telephone positions manned by women operators specially trained in the conversion procedures. It is estimated that at least 90,000 calls were received for information or other reasons during the course of conversion.

A street index was printed giving every street and number which indicated the section number of any address given by a customer requesting information.

Inspection and Quality Control

Rigid inspection was given the conversion work of the forces in the field. Extensive training on the conversion operation was given to a group of the company's servicemen used for the spot inspection work. This type of quality control pays dividends in reducing the number of complaints and the inconvenience to the customer.

Conversion Statistics

The company, at no cost to the customer, installed over 6000 heating customers' equipment with material and labor averaging $27 per customer. Over eight miles of aluminum pilot tubing were installed on burner units that required moving or dislocating the former copper tube.

Cost for the Conversions & Surveys forces alone will total over $2,000,000 with another $1,000,000 for the company's cost of sectionalizing, turn-in, customer education, and other miscellaneous costs.

More than $1,800,000 was spent before the first customer was converted to use natural gas.

This 16 in. pipeline coming up from the Willamette River Valley, following the top of a ridge, skirting two Douglas firs is part of the gas main and pipeline construction project United Engineers managed for Portland Gas and Coke Company.

United Engineers supervised distribution main extensions for Portland Gas and Coke Company's natural gas program

You, too, can profit from United Engineers' construction services for pipeline and distribution projects by supplementing the forces of your distribution department during the most active part of your construction program. We can, for example, operate as an adjunct to your inspection and supervision or handle definite portions of your construction program.

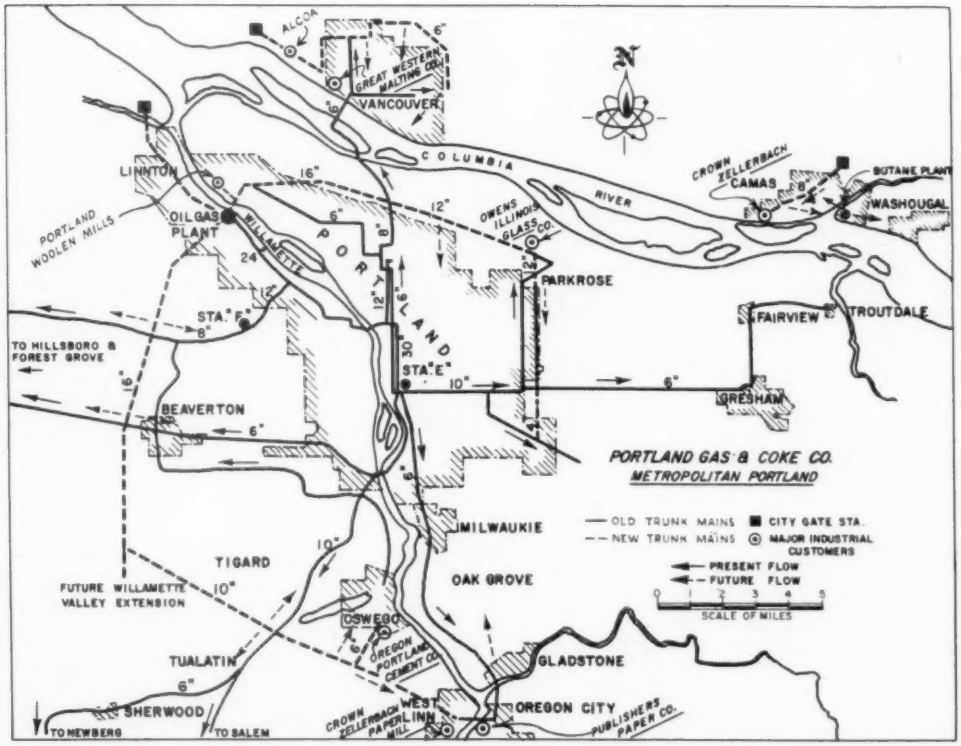
Our staff is comprised of well-qualified men of long experience who, in addition to being technically equipped for the work, are accustomed to handling and taking part in large construction operations. The services we are equipped to offer will assist in bringing to your organization the latest techniques and methods of construction and give you assurance that the work will be carried out in accordance with your specifications, with your high standards of security and safety, and at reasonable cost.

UNITED ENGINEERS

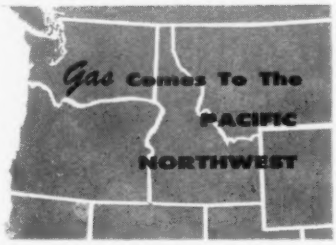
& Constructors Inc

U.E.&C. (Canada) Ltd.

New York 17 • PHILADELPHIA 5 • Chicago 2



Portland Gas & Coke's feeder main system in its metropolitan area is shown on map, with old system in solid lines and new mains laid this year in the broken lines. Until arrival of natural gas September 1, company supplied its customers from oil-gas plant at northwest corner of city, which pumped fuel seven miles to compressor station "E." This station, with lesser help from station "F" in West Hills, pumped gas through hub-and-spokes system to consumer districts. In new perimeter system, natural gas pipe line will push gas into city from borders. Station "E" will continue serving low pressure area, covering central east and west sides. New mains serve double purpose, connect with principal new industrial customers. Numerals indicate pipe diameters.



$30,000,000 By 1960

Portland Pushing Big Expansion Program

Herb Dwight
Manager of Distribution,
Portland Gas & Coke Company

PROSPECTS of a four-fold growth in consumption of its new fuel, natural gas, have prompted an expansion drive by Portland Gas & Coke Company that will approach the $30,000,000 mark by the end of 1960.

This year's outlay for new feeder mains, main extensions and services, gate stations, regulators, mixing station, and other facilities will mount up to nearly $6,000,000.

Stimulus of natural gas, with its new rates averaging 17 per cent below those for the previous manufactured gas, can be measured dramatically from the company's previous activity. From 1951 through 1955, spending for additions to plant averaged just about $1,000,000 annually.

The current five-year building spurt will be equal in cost to about three-fourths of the company's previous physical value, which on the books stood at $34,315,000 in 1955 on the basis of original costs. The outlay also will be more than double last year's operating revenues.

All of the 83 communities on PG&C feeder mains will benefit from the expansion, from Camas and Washougal on the north bank of the Columbia River in Washington, southward nearly 100 miles to Corvallis, Albany, and Lebanon in the fertile Willamette Valley.

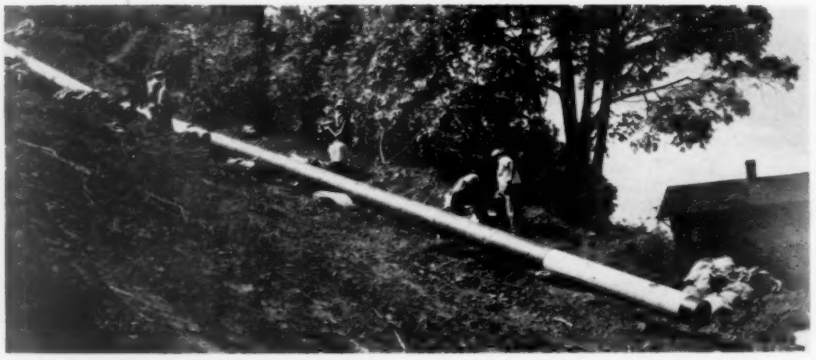
By 1960, Portland Gas & Coke expects to be selling 200 billion cu ft of gas a year to nearly 110,000 customers, compared to last year's 51 billion cu ft to 81,000. Expenditures for new extensions in its 475 sq mi service territory will continue to be heavy, climaxed by building of a second pipe line from Portland down the Williamette Valley.

Perimeter Type Feeder System

Heart of this year's building program is an entirely new perimeter-type system of feeder mains for the metropolitan Portland area. These new mains are augmenting the old hub-and-spokes system of distribution and actually multiplying the company's capacity to serve an area that now counts about 700,000 residents.

The new feeder mains, along with several shorter links to provide direct flows from them to key points on the existing system, are costing about $2,400,000. This year's job of laying close to 55 miles of feeder mains has been virtually completed.

One of tougher construction projects contracted by PG&C was laying of 16-in. westside feeder main. From oil-gas plant, line climbed steep 800-ft ridge: at one point, just below point in this photo, crew was forced to weld on section, then lower it down slope so another could be welded on. Coming down the side of a hill, where slope exceeded 35 deg, men had to be lashed to lines to work. In background is Willamette River and part of city's docks area.



The new mains are assisting mightily in the sectionalized conversion task now in progress. But the most important immediate benefit is moving natural gas directly to the largest industrial customers. The six largest are near the ends or directly on the new belt lines.

The new feeder mains were sized to their anticipated fifth-year loads, plus 50 per cent. They will strengthen rather than replace the old system, which fans out from a large compressor and holder station near the city center.

The perimeter grid will be more ideal, in that it will bring gas around the city, outside the most populated areas, and feed it in toward the center. This will shorten the travel of gas, and reduce its travel inside the city. Formerly, the manufactured gas was pumped seven miles from the north-end plant to the central compressor station.

Lower Operating Pressures

Sharp reductions in line pressures within the city, formerly ranging up to 100 psi, are being effected. In the past, gas for valley points to the south also was pumped through the center of the city at pressures up to 125 psi. But now, a new feeder main lying west of the city is carrying this load.

The old system, along with gas manufacturing facilities, had reached its limit, forcing a ban on additional heating customers in most districts. The heating freeze was lifted only this spring after nine years, partly because higher-Btu natural gas in effect boosts thermal capacity of the line by about 40 per cent, and partly because of the new perimeter mains.

Engineering Firm Hired

Construction of mains, service lines, and gate and mixing stations is approaching $4,500,000 in cost for the year. To assist with this suddenly accelerated program, the Portland utility called in United Engineers & Constructors, and that specializing firm carried through $2,800,000 in projects, including the six principal belt lines, mixing station, and the Portland and Vancouver gate stations. United's engineering costs and fees amounted to approximately $400,000.

PG&C's own staff has engineered and supervised close to $1,700,000 in construction of new mains and services. This includes the entire layout to bring in natural gas to Camas and Washougal, just east of Vancouver, Washington, with separate gate station and five-mile feeder main, and two regulator stations. The Camas-Washougal butane system was acquired only last May, so was not included in the projects assigned to United Engineers.

About $1,100,000 in projects where the utility handled its own engineering has been contracted to construction firms on an invitational bidding basis. The department of distribution is performing the work on projects costing $600,000 with its own Mains and Services crews.

Until mid-summer, M&S crews were installing all individual main extensions, but the volume increased so rapidly that many of the larger installations have been turned over to private contractors. A few of these are being made on a cost-plus basis.

The Portland company is shaping its own construction crews to a size in line with its anticipated new mains and services activity for the next several years. One additional reason for the recent swing to contract work is that several M&S crews have been diverted for about four months to man the sectionalizing and main purging operations during the applicance conversion period.

Besides its big-diameter feeder mains, PG&C this year has added

nearly 35 miles of main extensions. As of September 1, another 130 or more extensions were in the engineering stage for an additional 16 miles.

Much New Equipment Required

Steel pipe being installed this year amounts to 263 freight car loads. The 7907 tons of pipe purchased at a cost of $1,700,000 includes about 300 miles of ¾ to 2-in. and 160 miles in sizes from 4 to 16-in. Coating and wrapping as protection against underground corrosion is adding another $180,000.

Incidentally, the utility has purchased 75 new motor vehicles in the past 12 months, including 25 crew trucks. The latter are equipped with air compressor and six pneumatic tools, plus about $4000 worth of hand tools and safety devices, and each has two-way radio equipment.

PG&C now has two short-wave transmitters, one at the crest of the West Hills in Portland and the other a new installation, serving the Williamette Valley from a point south of Salem.

Here's Where

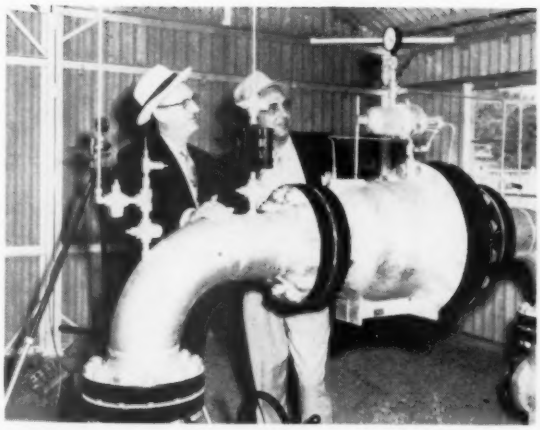
Here is a rundown on the new feeder mains which have been superimposed on the old metropolitan distributing system, as shown on the accompanying map:

Natural gas flows into PG&C lines at Sauvies Island at Portland's northwest outskirts, from Pacific Northwest Pipeline Corporation's lateral which crosses under the Columbia River from its 26-in. line north of Vancouver, Washington.

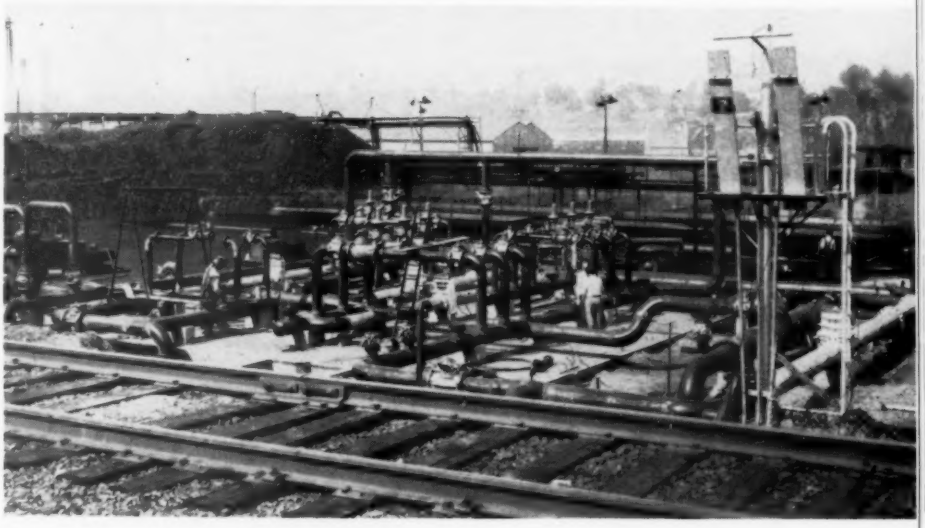
The utility's 45-year-old gas making plant is in the same corner of the city, and a new 16-in. main transports natural gas to that point, where a $217,000 mixing station has been constructed. The oil-gas operation will be continued for extensive peak-shaving during the winter months, producing as much as 2,600,000,000 cu ft annually. By gasifying straight run fuel oil into 1000-Btu gas matching natural gas, the plant's 14 generators will be capable of putting up to 30,000,000 cu ft per day into the system.

Heavy oil, which is normally used, yields up to 18,000,000 cu ft a day, with quantities of byproducts.

The Portland company has built up byproducts to nearly one-fourth of its total sales, and it plans to continue this sideline. Last year it realized $3,110,000 from sales of a benzene-toluene mixture, electrode pitch for aluminum

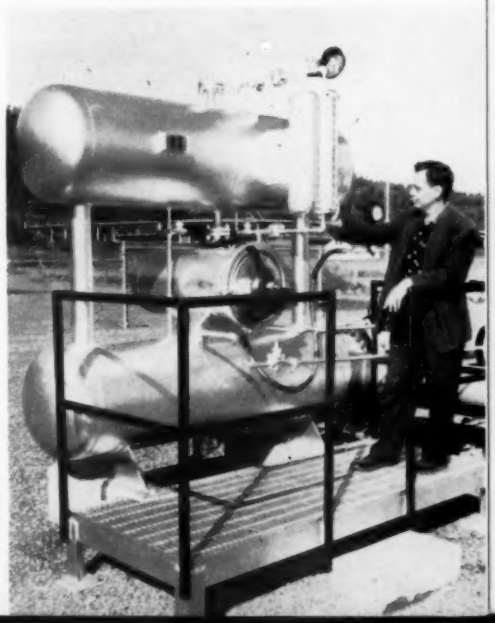


Natural gas was turned into PG&C system on September 1 at Sauvies Island gate station at northwest corner of Portland by Pacific Northwest Pipeline Corporation. Richard D. Ricketts (left), president of Fish Northwest Constructors, Inc., which built the pipe line from the San Juan Basin, and James F. Bell, executive vice president of PG&C, watch gage reach 300 psi as gas is turned in from pipe line, which was at 600 psi. Later, the systems will be at 800 and 400 psi.



PG&C's mixing station is shown partially constructed, before iron grating and all-metal building were added. Station located on oil-gas plant site, will mix in manufactured gas during heavy load periods. This unit cost $217,000.

Odorizing equipment installed at Sauvies Island gate station by PG&C. Odorant will be mostly tertiary butyl mercaptan, and about $5000 worth will be used annually. Frank Zitso is staff engineer on effective odorization.



The Author

Herb Dwight, manager of distribution for Portland Gas & Coke Company, joined the Northwest utility last November after 30 years in gas engineering and construction in his home state of California. From 1925 to 1951, Dwight was with Southern California Gas Company and predecessor firms, rising to supervising engineer in the Los Angeles metropolitan area. Then he joined Alex Robertson Company, pipe line contractors, to open its northern California branch in the San Francisco area, where he was manager four years. Native of San Francisco, Dwight obtained his degree in mechanical engineering from Stanford University in 1924.

Work progresses on twin feed-in lines near PG&C mixing station (left). PG&C distribution crew (right) installs 12-in. sectionalizing valve, last of 350 valves installed in $200,000 project to provide shut-off and turn-on points in the 43 sections being converted in the metropolitan area. About 150 existing valves were reconditioned for conversion use.

smelters, naphthalene, and carbon. The latter item, sold mainly in household briquets, has been eliminated in the change to higher Btu gas, while the proportion of pitch to oil processed will nearly double.

Two new 16-in. belt lines fan out at right angles from the plant. The eastbound feeder main extends nearly 11 miles, almost to Parkrose, a suburb at the northeast corner of Portland. At its present terminus, the first large new industry to come to the area on the promise of natural gas, Owens-Illinois Glass Company, is being served now at its container factory.

The other belt line swings south across a steep hill and into the Tualatin Valley through fast-growing suburbs for 12 miles. It will be extended later as a second line to Salem and other upstate cities.

From the end of this westside feeder, a 10-in. main takes off southeastward for 16 miles to West Linn and Oregon City. By the end of September, natural gas was fueling burners at two large paper mills of Crown Zellerbach and Publishers Paper companies. Together they have signed up for a maximum of 14,000,000 cu ft a day.

From the West Linn line, a 2½-mile stub will furnish natural gas to Oregon Portland Cement company, second largest industrial account. On the north side of the Columbia River, a nine-mile belt line has been laid around the north perimeter of Vancouver, Washington, from PNW's gate station to the west.

Several industries add to Vancouver's importance as a gas consumer. One of Alcoa's larger aluminum reducing and fabricating operations will be served directly off this 6-in. belt line. A mile-long spur will reach Great Western Malting Company, and other industries within Vancouver.

In the future Vancouver will be independent of the Company's oil-gas in Portland. The Oregon company has supplied gas to the Washington city for more than 30 years by means of a pipe line crossing under the Columbia. This line is to be deactivated.

Twelve miles east of Vancouver, a third PNW gate station will serve Camas and Washougal. A five-mile main, with two regulator stations, is being completed to Crown Zellerbach's mill there, the largest diversified papermaking plant in the world. This mill alone has been signed for 12,000,000 cu ft per maximum day.

Butane Mixing Station

During peak load periods, the company has operated butane mixing stations at Portland, Vancouver, Salem, and Granger, the latter between Albany and Corvallis at the south end of the system. The Camas-Washougal system has operated on butane for 21 years.

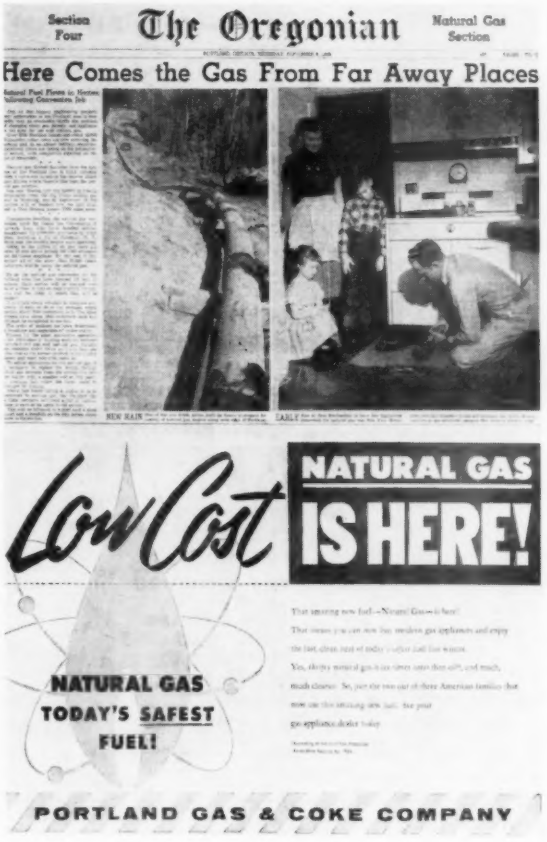
Installed butane capacity has been able to put into the manufactured gas stream all it could absorb up to the highest Btu tolerated by customer equipment, adding up to 17,000,000 cu ft a day to the supply.

Four present butane stations will remain in service, but those in Vancouver and Camas are being closed as the unconnected systems there will be on straight natural gas. Additional facilities are planned to boost butane capacity to 30,000,000 cu ft daily. These will cost an estimated $700,000.

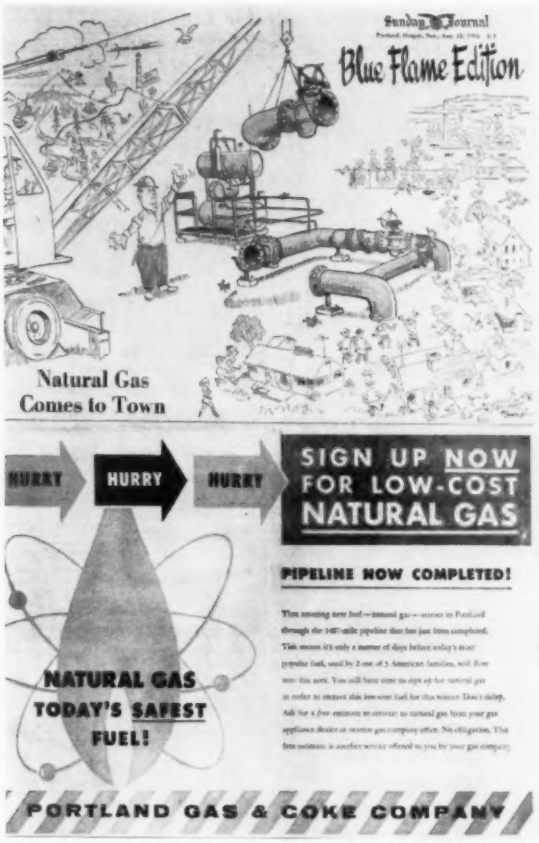
Pacific Northwest Pipeline will step its gas down from 800 psi to 400 psi at the three PG&C gates. This will be sufficient to push the fuel to Salem and points south. Pressure regulators will step down natural gas for the main districts.

Except for injection of manufactured gas and butane-air mix during high load periods, pipe line pressure will move natural gas into most districts.

The mid-city compressor and holder station will concentrate more on central east side, which has a low pressure grid. Even there it will have help from a new 12-in. main connecting the new north belt line with PG&C's major residential area. ★ ★ ★



This 12-page "Natural Gas Section" appeared in the Thursday, September 6, 1956, issue of Portland's *Oregonian*.



"Blue Flame Edition" of the Portland *Sunday Journal* appeared on August 12, 1956, about a month before natural gas arrived.

Special Newspaper Sections Promoted "Gas Era" For PG&C

One sure way to attract the attention of the public is to tie-in with a "Sunday section" or a "special section." The advent of natural gas in the Pacific Northwest market, and specifically in the Portland, Oregon area, was big news to the area's populace, and especially to the newspapers serving the region. They, in cooperation with the gas company, capitalized on this "built in" selling advantage, as shown by the three special newspaper sections illustrated here. Editorial material in the sections tied in well with advertising copy, aiding both the advertiser and Portland Gas & Coke Company in its efforts to acquire new customers.

Largest "Home & Garden" section in history of the Portland *Sunday Oregonian* was published in March, and contained 2538 column inches devoted to gas—almost 82 per cent of the section!

Officers of Portland Gas & Coke Company, photographed at one of their many conferences preparing for natural gas, are, from left: R. G. Barnett, vice president in charge of customer service; Harry N. Burnside, secretary and assistant treasurer; Cecil V. Griffith, treasurer and assistant secretary and controller; Charles H. Gueffroy, president; James F. Bell, executive vice president; Wesley A. Cook, vice president in charge of rates and regulatory matters; Patrick B. O'Rourke, operating manager; Charles R. Holloway, Jr., vice president in charge of marketing.

The Men Who Are Guiding Portland Gas & Coke

Charles H. Gueffroy, President and Director, has amassed 37 years of experience in gas utility operations. He joined PG&C in 1919 as secretary to the president. He was named assistant to the president in 1933, and by 1939 was taking part in the company's financing activities. In 1945, he was elected vice president, in charge of byproduct sales and development. He was elected a director in 1947, and president in April, 1949.

Long active in affairs of the industry, Gueffroy now is member of the Advisory Council and of the PAR Committee, American Gas Association. In his home city, he is a director of the Chamber of Commerce.

James F. Bell, Executive Vice President and Director, accepted a post with Portland Gas & Coke in February, 1946, as assistant to the president. He was elected vice president in 1949 and a director in 1950. In July, 1955, Bell was appointed executive vice president.

A 1932 engineering graduate of Stanford University, he received a doctorate in geology from the University of Munich. He was geologist for a petroleum company at Houston, then a fellow with National Research Council at Harvard and MIT. He became a research physicist for Consolidated Electric Light & Power at Baltimore, then was chief engineer for the U. S. purchasing commission at Rio de Janeiro.

Charles R. Holloway Jr., Vice President in charge of marketing, joined PG&C in that capacity last January to head up the company's intensive sales campaign on natural gas. For nearly 20 years he was with a Portland firm whose principal business is in fuel oil, and was its vice president and general manager five years.

Holloway possesses a notable civic record. He is on the board of the Oregon State System of Higher Education, and is a director of several charitable organizations and a savings and loan firm. He climaxed several years in Portland's United Fund campaigns by managing the 1955 drive to 101 per cent of its $3,003,644 goal.

R. G. Barnett, Vice President in charge of customer service, and Director, accepted a vice presidency with PG&C in 1938, after nine years in Brazil as a director of Emprezas Electricas Brasileiras, engineering and management company operating 41 utilities. He started with Pacific Gas & Electric at San Francisco in 1922, then joined Coast Counties Gas & Electric in California for three years. The Portland utility elected him a director in 1946.

Barnett was a director of American Gas Association 1942-1951, then served on the Advisory Council through 1954. He was chairman of AGA's Publicity and Advertising Committee from 1947 to 1951, and also served on AGA's National Advertising Committee in 1945 and again from 1951 to 1954.

Wesley A. Cook, Vice President in charge of rates and regulatory matters, joined Portland Gas & Coke in 1946, rose to assistant to the president in 1949, and was elected to his present post in 1955.

His utilities' experience began in 1931, after graduation in engineering from Oregon State College. From 1936 to 1938 he was division engineer for the Public Utilities Commissioner of Oregon. From 1940 to 1942 he was rate engineer for Pacific Power & Light and Northwestern Electric in Portland. He also spent several years in sales and engineering with two oil companies.

Cecil V. Griffith, Treasurer and Assistant Secretary and Controller, has been with the Oregon gas utility exactly 30 years. He rose steadily from statistical accountant to statistician to chief accountant in 1936, and assistant treasurer in 1948. He was elected treasurer and assistant secretary in 1950, and was named controller in 1951.

Harry N. Burnside, Secretary and Assistant Treasurer, joined the PG&C force early in 1926 as a clerk, nine years later was named assistant to the secretary and treasurer, then assistant secretary in 1948. He was elected to his present dual position early in 1950.

Burnside is a member of the Bar, dating back to 1939. An Oklahoma native, he attended Oregon State College and University of Oregon. He is a member of the Corporate Secretaries Committee, American Gas Association.

Patrick B. O'Rourke, Operating Manager, went to work for the company in 1947 as personnel and job training engineer. He soon stepped up to administrative engineer, then to assistant superintendent and to administrative assistant to the vice president. He became operating manager January 1, 1952.

O'Rourke began his gas industry career in 1944 with Southern California Gas Company, rising in three years to staff engineer to the plant superintendent. A native of Spokane, Washington, he obtained degrees from Gonzaga University in Spokane and Santa Clara University in California.

Spokane Natural Sees Big Future in Natural Gas

Nathan H. Gellert, Jr.
President, Spokane Natural Gas Company

WITH more than 5000 new residential customers signed up for natural gas service, Spokane Natural Gas Company is tapering off its new area solicitations to concentrate on getting gas service to those who have already signed. When Spokane connected all these new customers, it had nearly doubled the amount it started with last April. Ray G. Penning, Spokane's manager of sales, expects to sign up another 5000 customers next year. Beyond next year, he isn't guessing, but he points to the census figures that show there are 70,000 dwelling units in the company's service area. Penning considers most of these to be bonafide future prospects.

Like other Pacific Northwest utilities, Spokane Natural Gas Company has exceeded its initial estimates on industrial gas sales. Early in August the company tallied up its industrial sales at $2,500,000 annual revenue, with additional business expected to develop before the end of the year. (See table.)

The company this year is concentrating on building residential load for heating by natural gas. Almost all of the city's heating contractors and dealers are handling gas furnaces and conversion equipment.

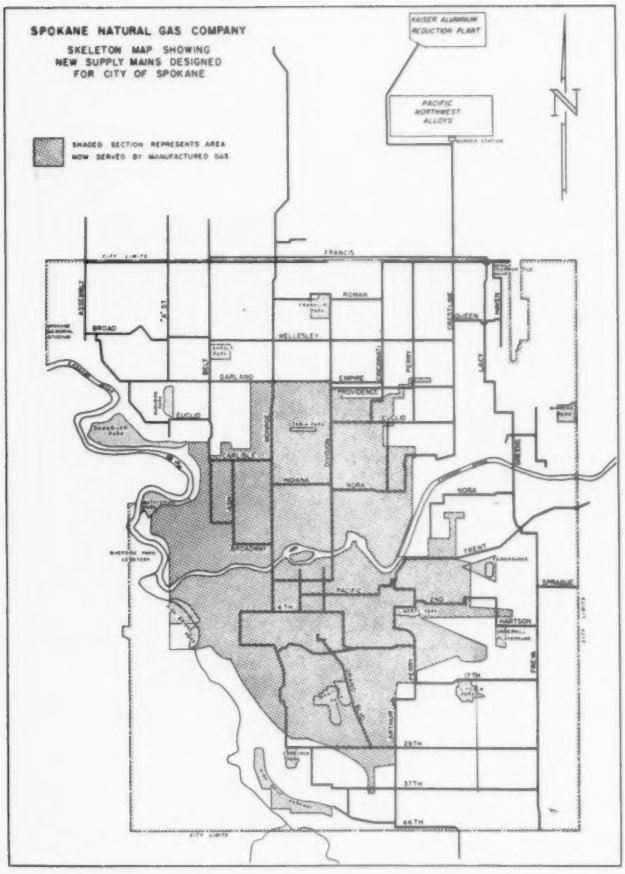
A brisk business in conversion equipment is expected for the next few years and the gas company also will promote gas hot water heaters and ranges.

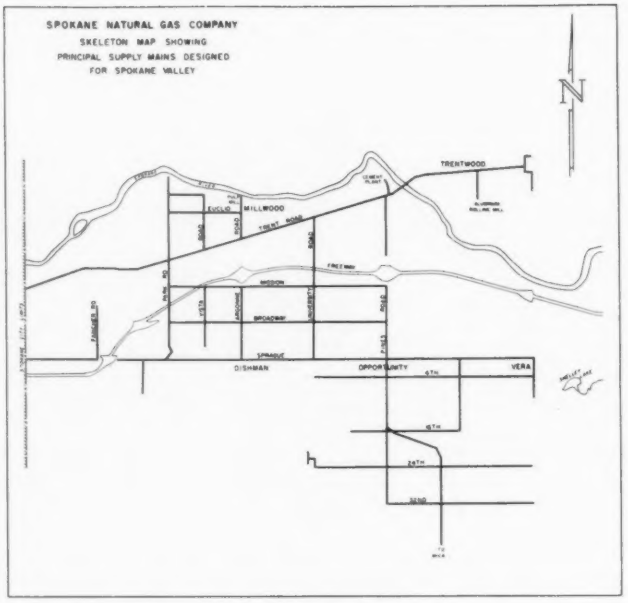
Most of the new customers that Spokane Natural will serve this year are on the company's "new" system. This system, totaling about 200 miles in total length of main, will lie principally to the north and east of the company's 160 miles of old system. Two major supply mains bore through the heart of the old system to assure adequate gas supply. When this year's construction season is over, the company will have spent over $6,000,000 for new distribution facilities.

To carry on its enlarged responsibilities, the company is planning to move into new and larger quarters. A new office building is under construction on the north side of the downtown business district directly across the street from the new municipal auditorium. A new operating base will be built in the Spokane Valley about 15 minutes east of the downtown area on a four acre plot of land. Both buildings are expected to be occupied by the time next year's construction season rolls around.

Spokane Natural Gas is presently certified by the Washington Public Service Commission to serve an area in eastern Washington (as shown on map). On file with the Washington Commission are requests for additional service areas encompassing Medical Lake, Cheney, Colfax, Pullman, and a small area immediately adjacent to the present certificate area. Spokane also has been granted franchises by the

Boiler house heating plant conversion involved insertion of a gas burner ring on each oil burner unit. Oil piping and controls were merely supplemented with gas lines and controls since existing burners were oil-gas combination units. All three boilers were converted to gas but could easily resume oprations on oil on an interruptible basis. Capacity of each boiler is 30,000 lb of steam per hr.





Maps right and above show location of new city grid in City of Spokane and in the Spokane Valley areas.

First run of gas main to the Trentwood rolling mill from the utility's meter house leads to a regulator station shown under construction. Gas pressure is reduced at regulator station for the remelt, boiler house and machine and forge shop feeders.

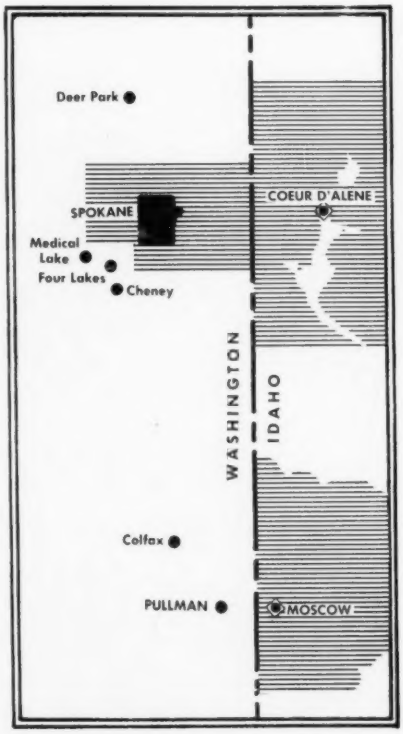
towns of Medical Lake and Cheney. The company plans to acquire a franchise in Pullman from the Whitman Distributing Company, and expects to receive franchises from Colfax and Deer Park. In the latter two towns, franchise ordinances have already passed the first reading.

In Idaho, the Kootenai Natural Gas Company has a state certificate to serve Kootenai county in which Coeur D'Alene is located, and the Latah Natural Gas Company has a certificate to serve Latah county in which Moscow is located. Spokane plans to acquire the certificates and franchises of both these companies.

Design and supervision of Spokane's construction program is being handled by Fish Service and Management Corporation of Houston, Texas, with R. A. Nevill as local project manager. Hallmac Construction Company is the contractor.

The company has plans for construction of distribution systems in cities adjacent to Spokane. Some of these cities are expected to receive natural gas service this year, but the initial construction in other areas will have to wait until 1957.

Kaiser Aluminum & Chemical Corporation will be one of the largest users of natural gas in the Spokane area



Areas and cities served by Spokane Natural shown above. In addition to Spokane and several other smaller cities, general service areas in Eastern Washington and Western Idaho are indicated by shaded areas.

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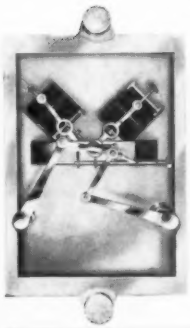

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The Superior open-top design replaces the time-honored soldered back plate with a new open-bridge construction. Valves and all above-table working mechanisms are easily accessible as soon as the top is removed. For proving and valve adjustments, a hand-hole plate in the top cover is available. A special stuffing box on the index shaft prevents escape of gas should index glass be broken. Top edges of the main case are extra wide so that the cover can be made smaller. This makes it easier to do a surer, safer soldering job, particularly around the pipes.

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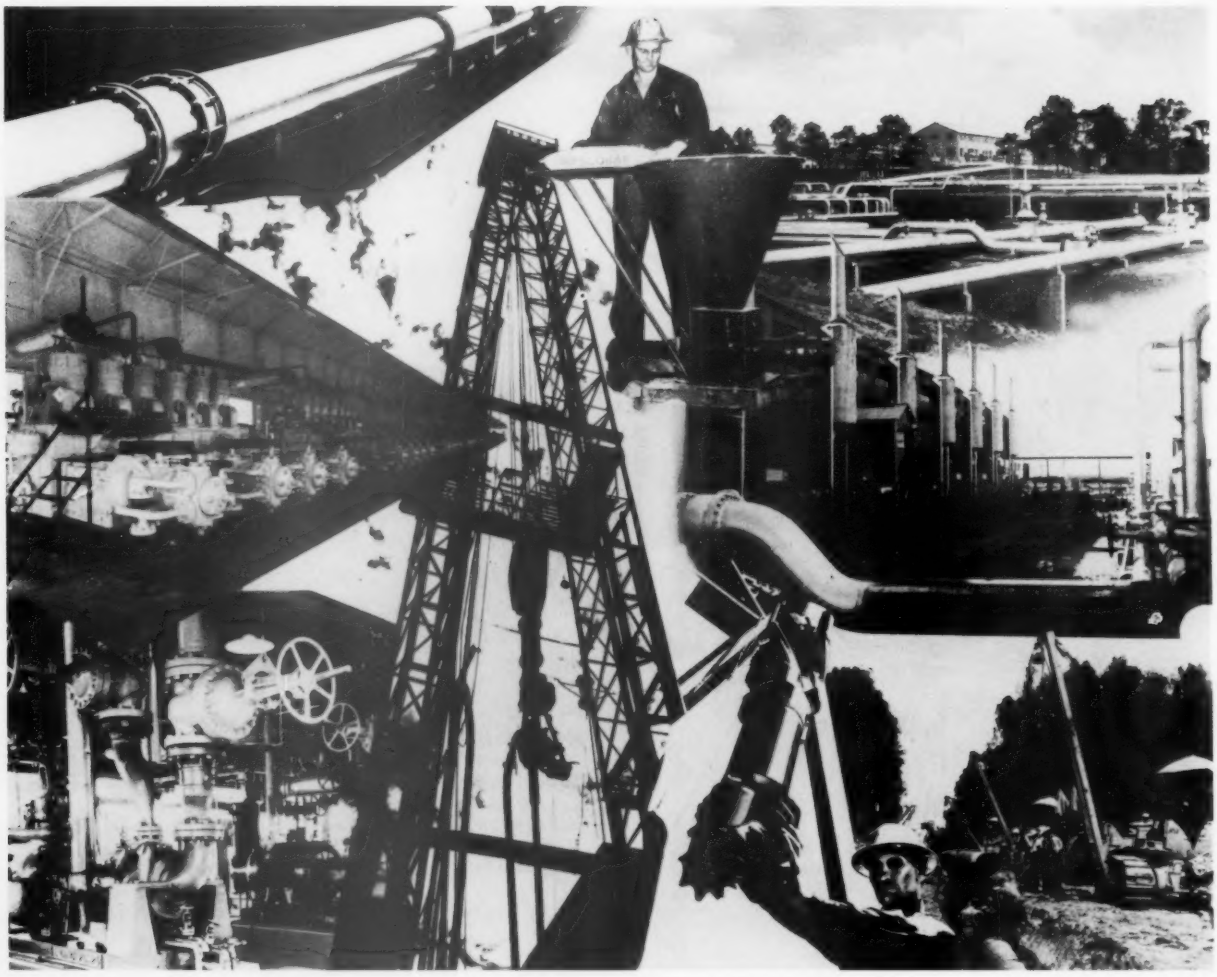

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IDECO, Dallas, Tex.—Hydrair* and Power Rigs; Full-View* Masts; substructures; single, dual and Drive-In Rambler Rigs; blocks, swivels, rotaries; mud pumps; petroleum equipment and supplies.

LANE WELLS

LANE-WELLS CO., Los Angeles, Calif., Houston, Tex., Oklahoma City, Okla.—Electric and Radioactivity Well Logging, Koneshot* perforating and bullet perforating, packers and bridging plugs.

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MAGNET COVE BARIUM CORP., Houston, Tex.—Magcobar* and Magcogel* drilling muds and other specialized oil well drilling fluids and chemicals.

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PACIFIC PUMPS, INC., Huntington Park, Calif.—Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

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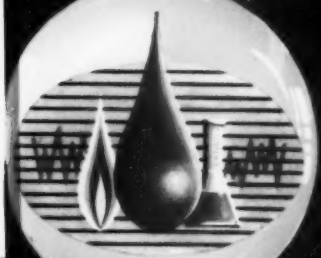
ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, vacuum pumps, and positive displacement meters.



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SECURITY ENGINEERING DIVISION, Dallas, Tex., Whittier, Calif.—Rock bits, reamer rock bits and hole openers; reamers, casing scrapers and Neo-Red rubber stabilizers.

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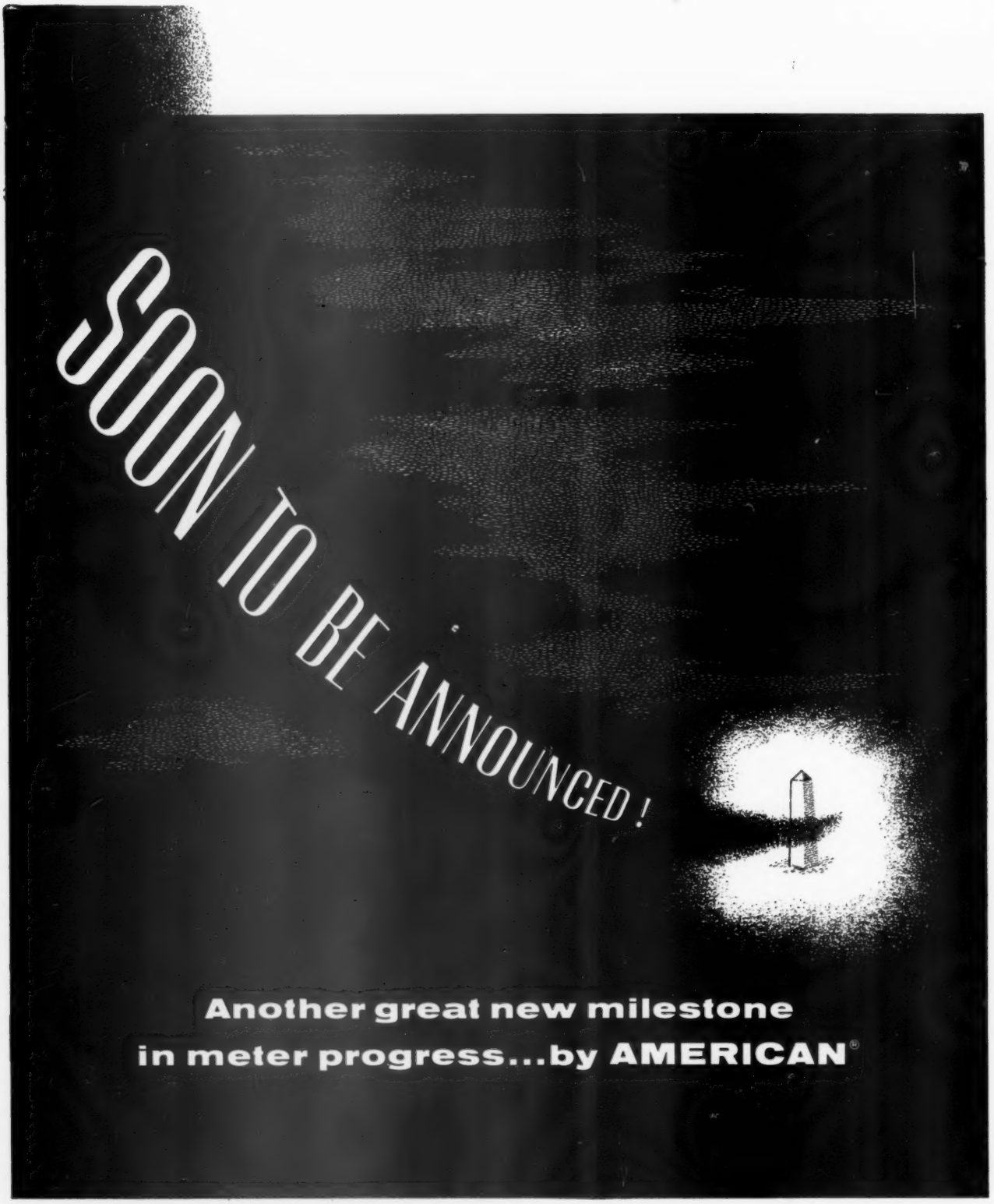

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when installations are complete and gas is delivered to the corporation's Mead reduction works and Trentwood rolling mill. The two plants will use more than 12,700,000 cu ft per day.

About 10,000,000 cu ft will be used at Trentwood, primarily in the remelt department. At Mead works 2,758,000 cu ft will be utilized primarily in three areas of the plant. Natural gas replaces the oil formerly used for heat energy. Gas will not reduce the amount of electricity used in the reduction of primary aluminum.

Kaiser Aluminum's Mead works, the second largest aluminum reduction plant in the United States, produces approximately 1,000,000 lb of primary aluminum daily. Located just north of Spokane, the plant operates on a 24-hour day, seven-day-a-week basis.

Carbon blocks weighing 200 lb each, 24 to each reduction cell, are used to introduce electricity into the process. The current flows from the carbon anode block through the molten bath to the carbon lining of the cell or "pot." Manufacture of these carbon blocks will be a major area in which natural gas will be used.

The blocks, made up of petroleum coke aggregates bound together with petroleum pitch, are pressed out hot. This pitch binder and all other combustibles must be baked out of the block before it can be utilized in the reduction cell. The blocks are placed in pit-like furnaces for baking. There are three large carbon baking furnace rooms at Mead. These furnaces will use about 1,340,000 cu ft of gas daily.

A large use of gas at Mead will be the rolling ingot casting furnaces. Here molten metal, taken from Mead's 16 potrooms, is brought for casting in 5000 lb rolling ingot. About 50 per cent of Mead's production is currently going into these ingots. The furnaces, which hold the metal in molten state until cast, will use about 318,000 cu ft of gas daily. The plant boiler house will utilize 800,000 cu ft daily, while another 300,000 cu ft will go into miscellaneous requirements throughout the plant.

When complete at Mead works, the installation will incorporate approximately 1200 ft of 6-in. pipe, buried underground, and about 10,000 ft of 5-in. to 1½-in. pipe above ground.

All burner conversions at the Mead plant will incorporate the latest design features to assure safe, efficient combustion of the gas.

At the Trentwood rolling mill natural gas replaced oil as the major industrial fuel in seven key production and maintenance areas scattered throughout the 525-acre plant site. Other industrial uses, including generation of inert gas for use in aluminum annealing furnaces, are on the planning boards.

Over 10,000 ft of main feeder pipe ranging from 1¼ to 10-in. were installed at Trentwood during July to serve the key areas including the boiler house heating plant, remelt furnaces, reclamation furnaces, machine shop, forge shop, continuous conveyor annealing furnaces, and the administration building heating plant. Total cost of the conversion, including materials and labor, was about $300,000.

More than a quarter of the nation's flat and coiled aluminum is produced at the Trentwood rolling mill. Capacity has been increased by 50 per cent to 396,000,000 lb per year since Kaiser Aluminum took over operations in 1946. About 80 per cent of the plant's production is now sold in coiled and flat sheet form to independent fabricators. The remainder is further processed at Trentwood into aircraft plate, irrigation tubing, bus paneling, shade screening, circles for utensil manufacturers, and a variety of embossed and corrugated aluminum products.

Biggest line laid at the Trentwood plant was a 10-in. line to the remelt and reclamation furnace area which will burn the 1000 Btu gas at the rate of about 200,000 cu ft per hour. A 6-in. line connects to the boiler house heating plant to serve a 100,000 cu ft per hour demand. The machine and forge shops are served by 1500 ft of 1¼-in. line for a combined load of 1500 cu ft per hour.

A 3-in. line extends south from the first regulation station for 4000 ft along the roof of the plant to serve a 12,000 cu ft per hour demand at the conveyor annealing furnaces.

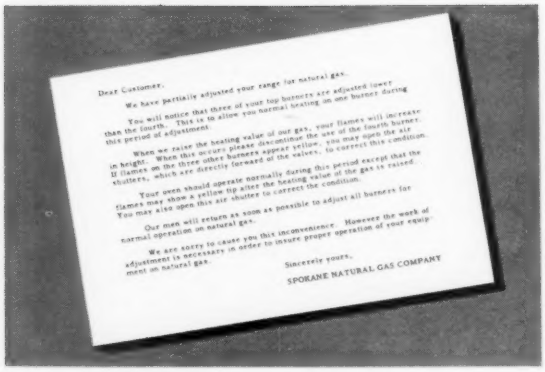
A 1½-in. line to the administration building heating plant is connected ahead of the second regulator station serving the conveyor annealing furnaces. The 2000-ft main serving the administration building supplies a 1000 cu ft per hour capacity heating plant.

Spokane Natural Gas Company

SUMMARY OF NON-RESIDENTIAL CONTRACTS AS OF JULY 31, 1956

	Annual Therms	Annual Revenue
Rate Schedule No. 3		
Medical Center Building	45,818	$ 3,137.05
Paris Cleaners No. 1, Sprague	25,480	1,916.52
Paris Cleaners No. 2, Washington	27,072	2,007.96
U. S. Macaroni Company	18,800	1,515.48
Columbia Electric—Wholesale	12,000	1,107.96
L. D. S. Church—1st Ward	18,055	1,300.00
Rosauer's No. 2	9,600	844.00
Rosauer's No. 3	10,400	884.00
Rosauer's No. 4	9,600	844.00
Angelo's Flowers	32,000	2,236.92
Whitworth College	368,800	22,479.00
Wendle Bros.	6,200	576.60
Mark Mukai	16,500	1,282.74
3 Minute Car Wash-Minute Maid	38,620	2,704.92
Cook's Roller Rink	11,500	1,062.60
General Machinery	52,600	3,895.96
Home of Good Shepard	38,000	2,620.65
Servicemaster of Spokane	6,000	598.00
St. Francis of Assissi Church	30,800	2,156.00
E. S. Burgan & Son, Inc.	31,200	2,173.49
Total Rate 3	809,045	$ 55,343.85
Rate Schedule No. 4		
Columbia Electric & Mfg. Co.	298,886	15,037.00
New Method Laundry	151,200	8,391.96
Spokane Linen Supply Co.	210,000	11,379.60
Spokane Rendering Co	245,000	12,613.20
Sacred Heart Hospital	1,051,400	48,486.07
Brewer Pine Box Co	168,000	9,147.96
Total Rate 4	2,124,486	$ 105,055.79
Firm Industrial Contracts		
Washington Brick and Lime Co	2,016,200	88,236.00
Gladding, McBean & Company	1,800,000	80,000.00
Pacific Northwest Alloys, Inc.	8,100,000	331,588.00
Total Firm Industrial	11,916,200	$ 499,824.00
Interruptible Industrial Contracts		
Kaiser Aluminum & Chemical Corp.	30,414,500	1,034,093.00
Fairchild Air Force Base	12,760,000	433,840.00
Ideal Cement Company	6,500,000	221,000.00
Lakeland Village	1,500,000	51,000.00
Medical Lake Hospital	2,000,000	68,000.00
Total Interruptible Industrial	53,174,500	$1,807,933.00
GRAND TOTAL	68,024,231	$2,468,156.64

Step-by-Step Conversion Followed in Spokane



Dear Customer,

We have partially adjusted your range for natural gas.

You will notice that three of your top burners are adjusted lower than the fourth. This is to allow you normal heating on one burner during this period of adjustment.

When we raise the heating value of our gas, your flames will increase in height. When this occurs please discontinue the use of the fourth burner. If flames on the three other burners appear yellow, you may open the air shutters, which are directly forward of the valves, to correct this condition.

Your oven should operate normally during this period except that the flames may show a yellow tip after the heating value of the gas is raised. You may also open this air shutter to correct the condition.

Our men will return as soon as possible to adjust all burners for normal operation on natural gas.

We are sorry to cause you this inconvenience. However the work of adjustment is necessary in order to insure proper operation of your equipment on natural gas.

Sincerely yours,

SPOKANE NATURAL GAS COMPANY

This notice was left at each range after the second step adjustment.

THE first step in Spokane Natural Gas Company's conversion began on April 25 with a crew of five supervisors and approximately 30 men. The first step consisted principally of reducing the gas input to most appliances by approximately 30 per cent. During this period, commercial appliances, refrigerators, and househeating appliances received special attention.

On June 4 the first step was completed, and on June 5, step two was started. The initial part of step two was the raising of the heating value of the gas from 650 Btu per cu ft to 1100 Btu. This increase resulted in an overrating of most appliances in the range of 10 to 20 per cent. Due to errors and inexperience in the field, a substantial number of appliances were over-gassed more than this amount, and some sooting of water heaters and ovens resulted.

Step two was completed by re-adjusting all burners to approximately 60 per cent of rated input, and installing natural gas orifices in all appliances except ranges.

Step three began on July 5 when the Btu content of the gas was raised to 1600. This created very little stir among the customers. Step three was finished about August 17 when the reorificing of all ranges and other appliances was completed.

Customers were kept informed of the conversion being undertaken by direct mail. A three-letter program was set up, with each of the letters (or cards) explaining to the customer what was to take place and when. A sample card is illustrated.

Natural gas began flowing into Spokane at 7 a.m. on September 18. Industrial customers on the main lines received gas first. Other customers received gas as soon as their lines were purged of test water and air.

After the main city lines were cleared, a pattern of area purging was begun. Some sections required one day's work while other took two days or more.

Most customers who were using manufactured gas were not able to detect the changeover to natural gas. The only noticeable difference was a slight change in the color of the flame.

The Washington State Public Service Commission has authorized October 17 as the date to begin billings at the new rate. Customers whose meters are normally read after that date, are to be billed at the new rate no matter when the changeover occurred.

Meter readings were scheduled in such a way that customers taking gas for the first time are to be billed only at the natural gas rate.

N. H. Gellert, Jr.

Ben H. Hoke

C. J. Melrose

R. G. Penning

The Men Guiding Spokane Natural

Nathan H. Gellert, Jr., President of Spokane Natural Gas Company, migrated to the state of Washington in 1945, after serving as manager of several small gas companies in the middle west and south. In 1945, he became distribution superintendent of Seattle Gas Company (now Washington Natural Gas Company). In 1955 he resigned as vice president in charge of distribution of that company to take his present position.

Ben H. Hoke, Vice President and Treasurer, is a native of Spokane. He entered the employ of Spokane Gas & Fuel Company in 1921 after attending Washington State College. He was elected a director and secretary in 1930, and in 1934 was given the added duties of treasurer. When the company name was changed in January, 1956, he continued as director and was elected to his present post.

Charles J. Melrose, Manager of Operations, is a native of Iowa, and attended schools in Washington, graduating with a BS degree in electrical engineering from Washington State College. He began his career as cadet engineer for Cities Service Company in Denver in 1917. He joined Spokane Gas & Fuel Company (then a Cities Service subsidiary) moving up to assistant superintendent until 1925, when he was transferred to Sedalia, Missouri. He later joined Toledo Edison Company, Toledo, Ohio, first as assistant superintendent and later as industrial sales engineer. He returned to Spokane in 1927 as industrial sales engineer and was named general superintendent shortly thereafter. He assumed his present post in 1956.

Ray G. Penning, Manager of Sales, started with Spokane Gas & Fuel in 1919, working part time while attending school. He later became plant chemist, plant foreman, and superintendent of promotion. In 1937, he was named by-products sales manager and in 1939 was promoted to manager of sales. He left the gas business in 1944 to become general sales manager of one of Spokane's largest automobile agencies. He returned in June, 1955, to the gas firm as manager of sales, the position he now holds.

Installing gas main on Spokane's South Side required removing big quantities of rock and old brick paving. Note sand padding on ditch bottom. More sand was used to complete backfill.

Here's what the Spokane city distribution system required in feet of new main construction in 1956:

Pipe Size Estimated	Footage Required
24"	15,719
20"	22,605
16"	25,793
12"	116,390
8"	117,100
6"	187,500
4"	67,920
3"	12,000
2"	700,000
Total (nearly 240 miles)	1,265,027

Piping A City of 250,000 At High Speed is Big Job

Backhoe cuts ditch for supply main in rocky area. Great deal of blasting was necessary. Charges were light, wire rope net covered ditch to prevent "spray."

Trencher cuts ditch for supply main along city street in residential area.

Contractor set up his own pipe coating yard using ingenious continuous feed for assembly line production.

Deep cut was made for railroad crossing.

It takes a lot of material for a distribution system, such as meters . . .

fittings . . .

and valves

For most part, only 600 ft of ditch could be open at any one time. Installation — welding, joint patching, backfill — followed closely behind ditching operation as shown here on large supply main job.

Construction equipment had to be versatile — such as this typical "bulldozer-backhoe-tractor" combination.

Design and Construction Features of The Cascade and Spokane Systems

W. D. Schoolcraft
Vice President,
Fish Management and Service Corporation,
Houston, Texas

WITH the construction of Pacific Northwest Pipeline, natural gas for fuel and heating has become available to the industries and people of the Northwest. To many cities in the area, the advent of natural gas has provided their first opportunity to offer what normally would be considered a full contingent of utilities as an attraction to residential and industrial growth.

To other cities, the availability of natural gas has provided opportunities for existing manufactured and propane-air gas utility companies to expand their distribution facilities with feelings of economic justification and security. These facts and an abundant supply of natural gas reflect a very bright future for the area of the Pacific Northwest.

Two of these utilities — Cascade Natural Gas Company and Spokane Natural Gas Company — have evidenced their faith in this anticipated growth by instituting extensive expansion programs. Agent for the companies in this expansion is Fish Service and Management Corporation, which has had full responsibility for the design and supervision of their new construction.

Cities now under franchise by Cascade to be served with natural gas include Athena, Baker, Pendleton, Pilot Rock, and Weston, Oregon; Anacortes, Bellingham, Burlington, Grandview, Granger, Kennewick, Pasco, Prosser, Sunnyside, Toppenish, Wenatchee, Yakima, and Walla Walla, Washington; Clarkston and Lewiston, Idaho.

Spokane Natural Gas Company will serve the cities of Spokane and environs, Colfax and Pullman, Washington, and Coeur D'Alene and Moscow, Idaho.

Upon completion of the projects both companies will have installed an estimated 700 miles of pipe, sizes from 2⅜ to 24-in. OD., excluding service line pipe and 86,000 meters including residential, commercial, and industrial.

Actual construction of these projects began in the spring season of this year and at this time, natural gas service has been initiated in several of the cities and all cities are scheduled to receive natural gas this fall season.

Design Features

1. All lines installed under these projects are of steel, plain ends, coated and wrapped pipe.
2. All design, construction, and testing was performed in accordance with Section 8 of ASA — B31.1 — 1955.
3. Lateral lines from Pacific Northwest Pipeline sales meter stations are to be operated at pressures of 150 psig.
4. High pressure mains in distribution system are to be operated at pressures of 75 psig.
5. New distribution intermediate pressure gas mains will be operated at pressures of 15 to 30 psig.
6. Old distribution systems, which will be converted to natural gas service, will be operated at the same pressures as now used and will not be upgraded.
7. All gas will be odorized at point of delivery from PNW Pipeline to gas company.
8. Actual field surveys were made of all areas in addition to the application of accepted procedures in establishing the consumption of respective areas. Considerations were given to geographic locations, degree day deficiencies, factual industrial consumer requirements, and provisions for normal expansion of the areas in the design of the laterals and distribution systems.
9. Certain advantages will be realized particularly in those towns not having existing distribution systems in that all equipment such as valves, meters, regulators, etc., will be of the same make and model providing a greater amount of efficiency and savings in the cost of maintenance and repairs.

Construction

The number of construction crews employed depended upon the size of the town and the type of construction involved as a considerable amount of rock and washed gravel was encountered in the majority of the towns served. There were times during the construction of these systems that a total of approximately 70 construction crews were working at the same time.

City rules and regulations and other regulatory specifications had to be complied with throughout construction of the systems. The various regulators controlled most of the general factors encountered in city distribution system.

Construction problems—such as the length of open ditch allowed, the depth of the ditch required, the number of streets to be closed, and testing procedures — were encountered by the contractors. In some cases a maximum of 300 ft of open ditch was allowed in front of the welders with a maximum of 700 ft allowed behind the welders.

The general procedure in all towns was to construct the key or grid system first, then concentrate on 2-in. gas mains and services. Most of the key systems have been completed and 2-in. mains and service lines are being installed.

The primary obstacles to overcome in the construction program were pavement removal and replacement, and encountering sold rock. Both hydrahammer equipment and saws were used in cutting the pavement. All pavement was replaced in accordance with city specifications.

All rock was blasted, even in the downtown areas, with the greatest amount of success. The size of shots depending on the location of the ditch and the amount of rock necessary to remove. Shot holes in some cases were covered with coils of wire rope matting with timbers and in some cases heavy equipment on top in order to minimize the effects.

In more open country and smaller ditches, manila rope matting and timber were used in shooting. Extreme care was taken to avoid the disturbance of other underground utilities.

Service line crews have been established to follow the 2-in. pipe instruction, installing services behind the gas company's sign-up crews where possible.

Yard coating machines applied the coating and wrapping at each of the centralized pipe yards where coated and wrapped pipe was distributed in that district.

High pressured lateral and distribution lines were tested with 225 psi of air for a period of 24 hours, with compensation being applied for temperature corrections. Pressure of 100 psi was applied to the intermediate distribution system piping under the same conditions. Service lines also were tested with 100 psi of air and left open for city inspection and approval before backfilling.

R. R. Herring

These Men Helped Make Visions Into Realities in the Northwest

W. D. Schoolcraft

C. A. Blanchard

E. G. Wesson

E. D. Matthews

Robert R. Herring, President of Fish Service and Management Corporation, was active during the formative and construction years of Pacific Northwest Pipeline, where he was formerly a vice president. He is presently a member of PNWPLCo's board of directors. The firm that he now heads has been engaged in providing engineering and construction services for several of the gas utility companies to be served by Pacific Northwest. Herring and his staff have been active in assisting those firms during their "growing pains." He started in the oil and gas business in West Texas and was general manager of a large operation in that area. He joined the Fish interests in 1939 and has since served as assistant to the president of Fish Engineering. He has served as consultant to numerous gas distribution and transmission companies and has personally directed the engineering, design, and construction of numerous distribution systems.

W. D. Bill Schoolcraft, Vice President of Fish Service and Management Corporation, is an oldtimer when it comes to years of experience in the gas industry. He was formerly with Lone Star Gas Company, leaving there to join the Morrison-Knudsen Construction Company in Idaho, and was later associated with Brown and Root, Inc., in Houston, as superintendent of that firm's pipe line department. He later formed his own pipe line construction company, which he operated until joining the Fish organization in February, 1956.

Charles A. Blanchard, Chief Engineer, came to Fish Service and Management from Houston Natural Gas Corporation, where he had spent 12 years and was chief engineer at the time he left. A native Texan and a registered professional engineer in his home state, he began his gas industry career with Lone Star Gas Company's engineering department and later spent nearly three years with The Austin Company in Houston.

E. G. Wesson, Design Engineer, began his career in the gas industry in 1926 with the West Texas Gas Company, a subsidiary of the old Prairie Pipe Line Company, in Amarillo, as engineer and draftsman. He joined the Missouri Valley Gas Company, which later became Northern Natural Gas Company, in 1930 as chief draftsman and later became that firm's chief engineer. He left in 1944 to become associated with the newly formed Tennessee Gas and Transmission Company in its engineering department, leaving there in 1952 to undertake various personal ventures in the gas industry. He joined the Fish organization in 1955 to work on design of the Cascade Natural Gas Company system.

M. D. Matthews, Accountant, is responsble for the corporate and construction accounting and general business functions of Fish Service and Management. A graduate of the University of Arkansas with BS and BA degrees, he has had eight years experience in utility accounting and business, including rate, construction, corporate, and systems work.

One of the principal eastern Washington communities served by Cascade Natural Gas is Walla Walla, shown in this aerial view. An agricultural center in the heart of important wheat producing country and food processing area, it is typical of the cities that will use seasonal gas as well as year-round residential and commercial service.

Cascade to Serve Far Flung Area

Stewart Matthews
President,
Cascade Natural Gas Corporation

AS natural gas arrives in the Pacific Northwest, the story of its trip from the idea stage to reality is made up of a series of success chapters. One of the most impressive records of swift expansion has been written by Cascade Natural Gas Corporation.

In three and a half years, since its organization in January, 1953, Cascade has made itself ready for the natural gas era in 28 communities of the region.

The organizers of Cascade knew that the integration of a number of small companies into a larger organization would have great benefits for large scale financing, centralization of engineering, accounting and management, and in operation.

Company officials have proven this, and integration has been completed in time for the orderly introduction of natural gas.

Besides the 28 franchises the company now holds, it has a number of applications for franchises pending that would increase the number of communities it serves to 35 or more.

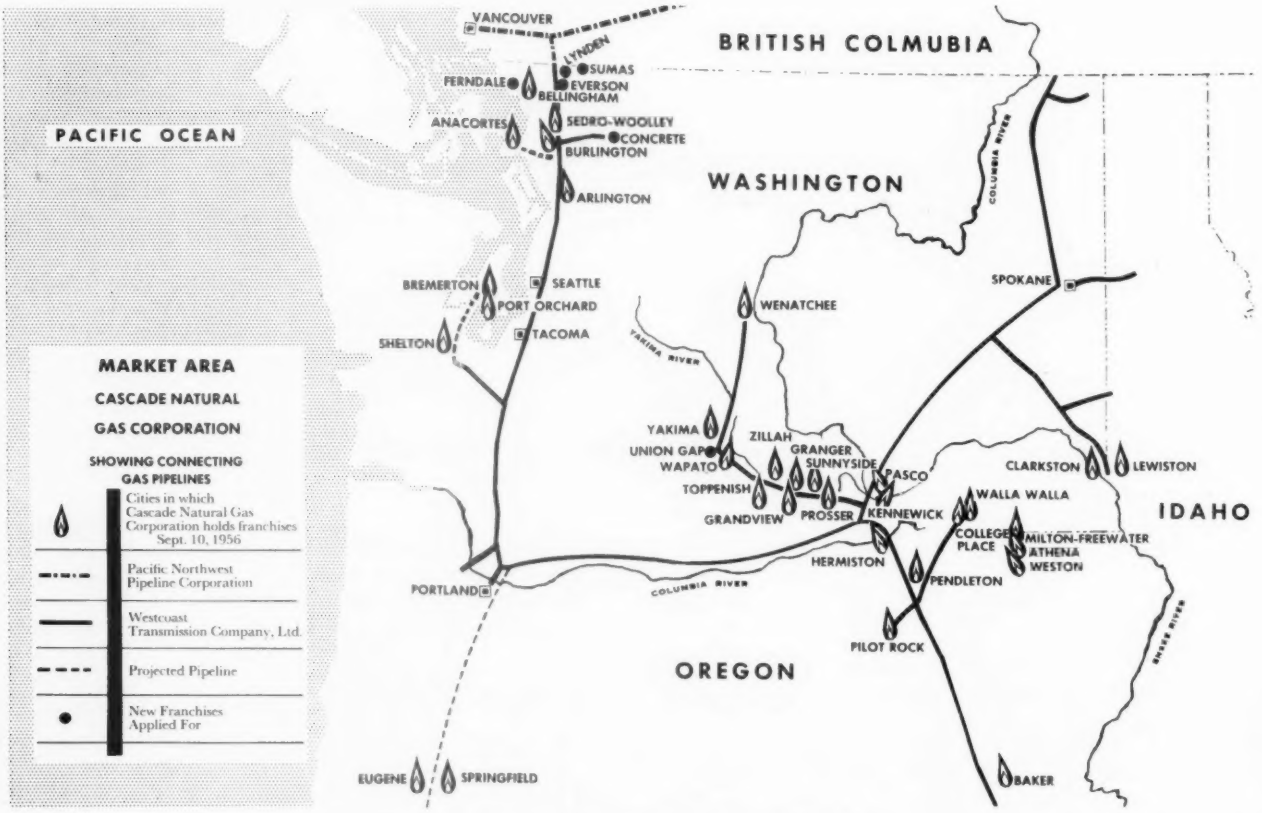
Cascade is constructing distribution systems in 24 towns in Washington, Oregon, and Idaho in 1956. Of these towns, 14 previously have been served by Cascade with propane-air or butane-air plants. The distribution facilities in these towns have been greatly expanded for natural gas service and the new systems will be tied into the old systems at convenient locations through regulators, so that improved service will be available to the customers under the natural gas system. In addition, the new systems are constructed so as to serve the principal populated areas, and will provide capacities for expansion as the towns grow.

The company plans, in the near future, to serve four other towns not now being operated by the company. The company also owns distribution systems in Bremerton and Shelton, Washington, and Eugene and Springfield, Oregon. These towns are included in the future planning of Cascade for natural gas service.

This year, Cascade will install, in the towns being piped for and converted to natural gas, approximately 5,680,000 ft of distribution mains and services, and 51,000 services. These towns are expected to grow from the present 6000 customers to more than 71,000 customers within five years.

Design of the new systems and expansion of presently operated systems was given much study. Specifications call for the most modern type of operation, embodying medium pressure feeder mains with district regulator stations discharging into existing low pressure mains. New areas in presently served cities as well as newly piped cities are being equipped with medium pressure systems with house regulators.

Present meters are being replaced with external type aluminum case meters and new installations follow the same specifications. Every effort has been directed toward the construction



Cascade will serve communities in Washington, Oregon, and Idaho, as shown on above map.

of an optimum natural gas distribution system at the lowest possible cost commensurate with proper safety standards and efficient operation.

A meter testing and replacement program, begun in 1954 and continued in 1955 and 1956, will greatly decrease future meter maintenance. Underground system rehabilitation has been underway in the same period and unaccounted-for gas losses have been greatly reduced because of this program.

Among the principal industries being served by Cascade with natural gas will be Chemical Lime at Baker, Oregon; the Oregon Fibre Products, Inc. at Pilot Rock, Oregon; the Utah-Idaho Sugar Company at Toppenish, Washington; the Coos Bay Pulp Corporation at Anacortes, Washington; Puget Sound Pulp & Timber Company and the Olympic-Portland Cement Company at Bellingham, Washington, and the Lamb-Weston Company at Weston and Athena, Oregon.

In general, industrial gas will be sold at a price substantially below the present market level of competitive fuels. Gas will be sold on an interruptible basis with 245 days' service being guaranteed. It is anticiated that the volume of gas supply, at least during the

Aerial view of the Puget Sound Pulp and Timber Company plant at Bellingham, Washington, typical of the large industrial users of natural gas served by Cascade Natural Gas Corporation.

first three years of natural gas service, will be such that nearly a full year's service will be offered.

Industrial gas sales contracts have been negotiated for a five year period, since the pipe line load pattern will probably change after the first five years with the build up of domestic and commercial load.

Completion of the distribution systems for natural gas service was too late to secure the major seasonal loads in the fruit valleys of Washington and Oregon. A great many of these industries are expected to convert to natural gas in 1957 and will be customers of Cascade thereafter.

The personnel of Cascade will grow as business is added and this small organization with 129 employees prior to starting work on natural gas systems, will increase to approximately 200 employees the first year and considerable increases will follow as customers are added.

The company plans to construct a new general office building in Seattle, modern in every respect, and with ample space for all departments. An aggressive sales program is planned, with model kitchens using all modern appliances for natural gas, as well as a progressive sales program for gas air conditioning that is planned for the future, particularly in the central Washington and Oregon areas. Home economists will be available for schools, churches, and other organizations requiring service of experienced personnel.

During the past two years, Cascade has sponsored in the cities it serves, schools for dealers, plumbers, city firemen, and building inspectors on the advantages of gas and the proper servicing of gas appliances.

Model safety ordinances have been filed with the fire and building departments of the cities and towns in which the company operates and expects to operate. These ordinances are modeled after the safety codes of the AGA and the Public Service Commissions of Washington, Oregon, and Idaho.

Experienced industrial and utilization engineers' services will be offered to customers throughout Cascade properties so that gas may be utilized in the most efficient manner. The company has acquired the services of experts in the various fields of measurement engineering, construction, design, public relations, and advertising in order to keep pace with the growth and progress of the Northwest occasioned by the introduction of natural gas.

C. S. Clark

Stewart Matthews

W. M. Little

H. B. Jones, Jr.

P. R. Dunbar

P. F. Toman

Outstanding Gas Men Guide Cascade's Course

C. Spencer Clark, Chairman of the Board and Director, received degrees in mechanical engineering from the University of Washington and in business administration from Harvard Business School. Following association with Allied Chemical & Dye Corporation in an engineering capacity, he served as operating manager of Van Waters and Rogers, Inc., chemical wholesaling firm, from 1942 to 1946. In 1946 he formed his own company to engage in the manufacture of agricultural chemicals, which was sold in 1952. Clark is chairman of the board of the Midland Coal and Lumber Company, Miles City, Montana, and a director of Northern Ontario Natural Gas Company, Ltd., and Magna Pipelines, Ltd.

Stewart Matthews, President and Director, has operated Northern Gas Company since 1939 and in this capacity was one of the pioneers in the bottled gas business in the Pacific Northwest. In 1945 he purchased gas properties in Bellingham and Wenatchee, Washington, from Puget Sound Power & Light Company and immediately sold the respective properties to Bellingham Gas Company and Wenatchee Gas Company, which had been organized for the purpose of owning and operating such respective properties. Since 1953 he has served as president and chief operating officer of Cascade Natural Gas.

William M. Little, Vice-President and General Manager, comes to the Corporation with 36 years of experience in the distribution of natural gas. He served with Arkansas-Louisiana Natural Gas Company as general superintendent of distribution. In his function as chief of operations, he has developed an organization of distribution and design engineers, construction superintendents, and experienced area promotional managers.

Harry B. Jones, Jr., Secretary and Director, has been practicing law in Seattle since 1937 and since 1940 has been a partner in the firm of Jones & Grey, general counsel for Cascade.

P. R. Dunbar, Treasurer, was treasurer of Seattle Gas Company, prior to his retirement in 1946. He engaged in part time duties as treasurer of Bellingham Gas Company and Wenatchee Gas Company from 1947 to 1953, when he became treasurer of Cascade Natural Gas Corporation. He is also treasurer of Northern Liquefied Gas Company, Inc., an affiliated company.

Phil F. Toman, General Sales Manager, has been active in sales work since the close of World War I. He was formerly with General Petroleums Corporation advancing from salesman to division manager, and has been sales and advertising manager for a number of nationally known appliance manufacturers. The aggressive advertising and sales program that he has directed for Cascade has created new interest in natural gas and has resulted in new gas customers and greatly increased sales in appliance and heating units.

Dragline dredges bottom of Snake River between Lewiston and Clarkston for installation of 4-in. gas main between cities.

Construction Panorama From The Cascade Natural Gas System

Steel building will serve as district meter shop in Yakima, Washington. Old gas plant site and holder can be seen in background.

Ditching machine cuts trench in Yakima street for supply main.

Interior of district meter shop. Men work on meters under ideal lighting and equipment conditions.

Installing Customer

Services in Yakima

Trencher moves across lawn carefully, cuts ditch rapidly.

Grass sod is set aside and replaced over trench after pipe is installed, a simple but valuable idea for good customer relations.

Simple bending replaces elbow fitting, is faster than welding.

Straight run pipe is welded together, tested and joint wrapped when cooled.

All pipe is coated, and all joints were carefully wrapped.

Final phase is installation of standard meter loop.

Impressive Slate of New Officer Nominees Readied for 39th Annual AGA Convention

A list of leading executives from gas utility, pipe line and manufacturer company members of the American Gas Association has been submitted by the General Nominating Committee as its slate of general officers, directors and section officers for the AGA Annual Convention to be held in Atlantic City, New Jersey, during the period October 15-17. Association officers, section chairmen, and vice chairmen will be elected for the 1956-57 Association year. Directors will be elected for two-year terms expiring in 1958.

Offices to be filled are those of president, two vice presidents, treasurer, 16 directors, and 11 section chairmen and vice chairmen. The list of nominees follows:

For president—C. H. Zachry, president, Southern Union Gas Company, Dallas.

For first vice president—A. W. Conover, president, Equitable Gas Company, Pittsburgh.

For second vice president — Robert W. Otto, chairman of the board, Laclede Gas Company, St. Louis.

For treasurer — Vincent T. Miles, treasurer, Long Island Lighting Company, Mineola, New York, re-nominated.

Dean H. Mitchell, president, Northern Indiana Public Service Company, Hammond, Indiana, becomes a director upon completion of his present term as Association president. Newly-nominated and re-nominated directors are: John B. Balmer, president, John Wood Company, New York; Everett J. Boothby, president, Washington Gas Light Company, Washington, D. C.; F. D. Campbell, president, New England Gas and Electric Association, Cambridge, Massachusetts, re-nominated; Marvin Chandler, president, Northern Illinois Gas Company, Aurora, Illinois; Carl E. Cloud, president, MidSouth Gas Company, Little Rock, Arkansas; Stuart Cooper, president, Delaware Power & Light Company, Wilmington, Delaware, re-nominated; C. H. Guefroy, president, Portland Gas & Coke Company, Portland, Oregon; J. J. Hedrick, president, Natural Gas Pipeline Company of America, Chicago; Robert A. Hornby, executive vice president, Pacific Lighting Corporation, San Francisco; Julius Klein, president, Caloric Appliance Corporation, Philadelphia; Donald C. Luce, president, Public Service Electric & Gas Company, Newark, New Jersey, re-nominated; Walter T. Lucking, president, Arizona Public Service Company, Phoenix, Arizona, re-nominated; George T. Naff, president, Texas Eastern Transmission Corporation, Shreveport; John C. Parrott, president, Roanoke Gas Company, Roanoke, Virginia. C. P. Rather, president, Southern Natural Gas Company, Birmingham, Alabama, re-nominated; E. H. Tollefson, president, Hope Natural Gas Company, Clarksburg, West Virginia, re-nominated.

Section Officers—To hold office one year:

Accounting Section

For chairman — W. D. Sweetman, superintendent, customers accounting department, The Peoples Gas Light & Coke Company, Chicago.

For vice chairman — D. W. Peterson, secretary and treasurer, Minneapolis Gas Company, Minneapolis, Minnesota.

General Management Section

For Chairman — Leslie A. Brandt, vice president, The Peoples Gas Light and Coke Company, Chicago.

For vice chairman — John H. Wimberly, president, Houston Natural Gas Corporation, Houston, Texas.

Industrial and Commercial Section

For chairman — J. Robert Delaney, manager, gas sales, The Cincinnati Gas & Electric Company, Cincinnati, Ohio.

For vice chairman—Roy E. Wright, director of gas sales, NEGEA Service Corporation, Cambridge, Massachusetts.

Operating Section

For chairman — Grove Lawrence, vice president, Southern California Gas Company, Los Angeles.

For vice chairman — Victor F. Bittner, assistant chief technical engineer, The Peoples Gas Light & Coke Company, Chicago.

For second vice chairman — Herbert C. Jones, gas engineer, New England Electric System, gas division, Malden, Massachusetts.

Residential Gas Section

For chairman — W. D. Williams, vice president in charge of sales, New Jersey Natural Gas Company, Asbury Park, New Jersey.

For vice chairman — A. G. Bur, vice president in charge of sales, Wisconsin Public Service Corporation, Green Bay, Wisconsin.

Nominees will be voted upon by the membership at the 1956 Annual Convention in Atlantic City, New Jersey, October 15-17.

Condensed Convention Timetable

Sunday, October 14

1 — 5 P.M. — Registration — Haddon Hall, Traymore, Auditorium.

Monday, October 15

9 A.M. — 5 P.M. — Registration — Haddon Hall, Traymore, Auditorium.
9:30 — 10 A.M. — Organ Recital — Ballroom, Auditorium.
10 A.M. — First General Session — Ballroom, Auditorium.
12 Noon — Executive Session — Ballroom, Auditorium.
2 P.M. — Accounting Section — Vernon Room, Haddon Hall. . . . Operating Section — Trimble Hall, Claridge Hotel. . . . Residential Gas Section — American Room, Traymore.
9 P.M. — President's Reception and Dance — Ballroom, Auditorium.

Tuesday, October 16

8 A.M. — Home Service Breakfast — American Room, Traymore.
9 A.M. — 5 P.M. — Registration — Haddon Hall, Traymore, Auditorium.
9:30 — 10 A.M. — Organ Recital — Ballroom, Auditorium.
10 A.M. — Second General Session — Ballroom, Auditorium.
12:30 P.M. — Accounting Section Luncheon Meeting — Vernon Room, Haddon Hall. . . . General Management Section Luncheon Meeting — Ballroom, Shelburne. . . . Industrial and Commercial Gas Section and Residential Gas Section Luncheon Meeting — American Room, Traymore.
1 P.M. — Ladies' Luncheon and Style Show — Renaissance Room, Ambassador Hotel. . . . Operating Section — Trimble Hall, Claridge Hotel.
2 P.M. — Home Service Round Table — St. Dennis Room, Hotel Dennis. . . . Industrial and Commercial Gas Section — Rose Room, Traymore.
9 P.M. — Entertainment — Ballroom, Auditorium.

Wednesday, October 17

9 A.M. — 5 P.M. — Registration — Haddon Hall, Traymore, Auditorium.
9:30 — 10 A.M. — Organ Recital — Ballroom, Auditorium.
10 A.M. — Third General Session — Ballroom, Auditorium.
12:30 P.M. — "Pattern for Progress" Luncheon Meeting — American Room, Traymore.

R. A. Malony

H. L. Wathen

Planning for something as big as the 39th annual convention of the AGA is no easy task. The two men responsible for the outstanding program scheduled for this year's convention, are: Ronald A. Malony, president, The Bridgeport Gas Company, who heads the committee preparing the program and Hugh Wathen, vice president, South Jersey Gas Company who heads the entertainment committee.

The Nominees:

For President

C. H. Zachry

For Vice President

A. W. Conover

R. W. Otto

For Treasurer

V. T. Miles

For Directors

J. B. Balmer

E. J. Boothby

F. D. Campbell

Marvin Chandler

C. E. Cloud

Stuart Cooper

C. H. Gueffroy

J. J. Hedrick

R. A. Hornby

Julius Klein

D. C. Luce

W. T. Lucking

G. T. Naff

J. C. Parrott

C. F. Rather

E. H. Tollefson

For Chairmen

W. D. Sweetman

L. A. Brandt

J. R. Delaney

Grove Lawrence

W. D. Williams

For Vice Chairmen

D. W. Peterson

J. H. Wimberly

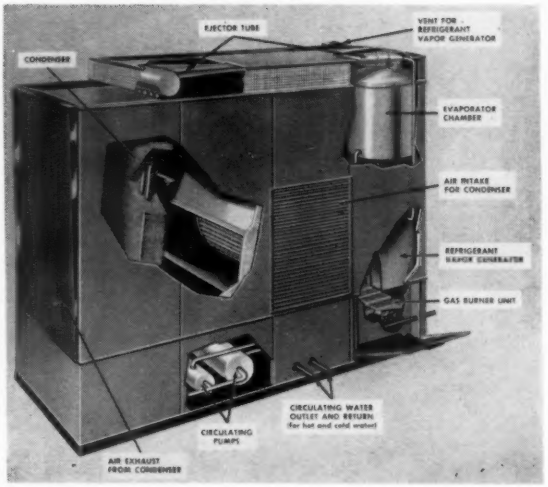
R. E. Wright

V. F. Bittner

H. C. Jones

A. G. Bur

New Jet-Principle Gas Air Conditioner Unveiled



AIR conditioning for homes of the future was shown to the press in a special demonstration at Chicago in late September by Rheem Manufacturing Company.

An operating prototype of a new central air conditioning unit, on which development work is being completed, was installed for demonstration at the laboratories of the Peoples Gas Light and Coke Company. This new approach to air conditioning, using gas for operation, has introduced extensive refinements to the jet principle of cooling, previously useful only in very large commercial or industrial applications.

The new air conditioning unit, thus far un-named by Rheem, consists of a small cabinet four feet long, two feet wide and four feet high. The unit may be placed outside of the home, instead of occupying expensive floor space or useful basement area, and the one unit provides both cooling for summer and heating for winter.

The change from cooling to heating — or from heating to cooling — is accomplished automatically by a conventional thermostat that is adjusted in the usual manner, according to the home owner's ideas of comfortable temperature. Then, the system delivers year-'round comfort without further adjusting.

Installing a warm air heating system with the new heating and cooling unit is a simple operation, using conventional ductwork. The furnace is eliminated, and, instead, a small cabinet is installed, enclosing a finned coil and a quiet, high capacity blower. Then chilled water is circulated through the coil for summer air conditioning while the blower dispatches cool dehumidified air throughout the house. During the winter, hot water is pumped through the finned coil, to warm the air stream from the blower.

In homes with hot water systems small, attractive convector units are situated throughout the homes. Each convector has its own fan to circulate air over a small finned coil, through which chilled, or hot, water is pumped.

Another aspect of the new system, for installation in hot water systems, is the ease with which it lends itself to an arrangements the experts call the "ideal combination." This combination uses hot water for sustained heat, with warm air for rapid increase in temperature, whenever the weather suddenly becomes much colder.

Circulating air either hot or cold in a homes makes at atmosphere more pleasant. Additional comfort comes from year-'round filtering of air, with humidification in the winter and dehumidification in the summer.

Versatile though the new unit proves to be, its revolutionary operation is based entirely on the use of a single gas burner unit.

The jet operation through which the cooling is accomplished is not to be confused with jet engines for aircraft. Instead, the newly-developed air conditioning unit operates in this manner:

A very small jet discharges refrigerant vapor inside of a specially contoured ejector tube. Discharge of the jet at supersonic speed accounts for much of its effectiveness.

First, there is a drop of several hundred degrees Fahrenheit in the vapor as it issues from the jet.

Second, high speed of the discharge entrains, or draws off, vapor of the refrigerant that is maintained in an evaporator chamber to which the ejector tube is connected.

As evaporation takes place in the chamber, rapid cooling is the result. This lower temperature, in turn, cools the circulating water that is pumped through a coil of copper pipe in the evaporator chamber.

Low temperatures are maintained by relieving the ejector tube of pressures that would ordinarily be built up by the jet action. This pressure reduction is accomplished by condensing the vapor in a specially-designed, unique air-film condenser that has been in use the past three years.

When controls call for heating, the vapor condensing phase of the operation ceases. The jet discharge is then diverted into the evaporator chamber, heating water that is being circulated in the copper coil, before it goes either to the finned coil in the blower cabinet, or to the hot water heating system.

The liquid-and-vapor system, that serves to cool or to heat, is a completely sealed operation. Some of the liquid is pumped into a refrigerant vapor generator to supply vapor pressure for the jet operation. Another portion of the liquid is fed into the evaporator chamber and both operations are regulated by simplified automatic controls.

Other controls in the sealed system regulate the gas flame under the refrigerant vapor generator by positive, self-actuating automatic valves. Liquid used in the system is non-toxic, non-inflammable, and non-corrosive.

No purchase prices have been announced for the new unit. Engineering and testing, however, have indicated that the new air conditioning and heating unit will be fully competitive, in both installation and operating costs, with any central air conditioning system now being manufactured for installation in homes.

The new gas-fired air conditioning and heating unit will not be marketed before 1958. Instead, it will undergo a broad program of field testing throughout 1957. Through the field test program, engineers will report on such subjects as operating efficiency, operating costs, and a comprehensive scope of reactions from home owners.

With field test units installed throughout the country, Rheem plans to have reports of operating results in a variety of homes, climates and other conditions that have a bearing on heating and air conditioning performance.

Where Does the GAS INDUSTRY Go from Here?

A speculation as to the long range outlook

William B. Tippy
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NATURAL gas has become a highly important element in the energy system of the United States —but it is still only one element out of many. Too often we think of natural gas as if the tremendous growth in its acceptance and in the volumes demanded by gas consumers — be they domestic, commercial, or industrial — were a thing apart and independent of the rest of the nation's energy system.

Perhaps the price advantage enjoyed by natural gas in most of the country since World War II, and the seemingly insatiable demand for natural gas for residential space heating in the central portion of the country have helped to create this illusion. It is, however, only an illusion. The position of natural gas at any given time as an element of the total energy system as dictated by completion as to almost every major gas application, within the limits set by supply and by the capacity of pipe line facilities to transport it to the markets.

Plenty of Competition

Competition always gets back to price, except for those most fortunate applications of natural gas where clear technological advantages make price relatively unimportant.

For cooking, today's chief competition is electricity. For water heating, oil or electricity. For refrigeration and drying, electricity again.

For space heating, oil; coal is the other principal alternative fuel, but studies show no correlation between gas prices and coal prices when we investigate space heating saturations. People want automatic heat, and that means oil or gas today, although the electric-powered heat pump and electric panel heating are beginning to make some showing. Electricity occupies the air conditioning field today, but through research gas may become a real competitor here. Industrial gas for specialized applications finds electricity as a competitor. As a large volume industrial energy source, it must compete with oil and coal.

Almost none of the market is protected, almost all of its highly competitive. And competition means price — price to the ultimate user after the gas has been found, hooked up to a transmission system, transported by the pipe lines to the market areas and distributed through complex and increasingly expensive urban underground distribution system to the user's meter.

Other Energy Sources

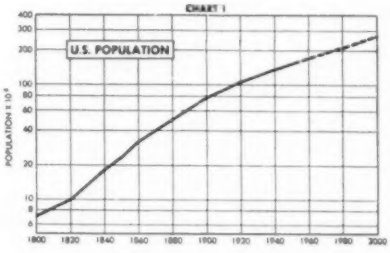
The competition, as we have seen, is with two basic energy sources — oil and coal — and with one refined form of energy — electricity. Electricity, in turn, depends for its basic energy sources on coal, oil, hydraulic energy, and now on nuclear energy derived from fission induced in the atoms of the present basic atomic energy sources — uranium or thorium.

Consider what is happening to the total energy system of the United States, "in the round," and not on a fragmentary basis, to see how natural gas fits into the overall picture, particularly as to the future.

Here warning should be given that the figures for future years can only be first approximations offered for discussion and criticism. Too many unforeseen factors may appear to make these projections into the future take on the character of forecasts. It is hoped, however, they may serve to indicate the general range within which the energy system may operate.

Population

First, in examining the total energy picture, we need information about the population of the country to form a basic divisor or yardstick to tell how we've been doing and to speculate from as to how we may do in the years ahead. Chart I shows actual population from 1800 through 1955, when we reached 166,000,000 people, and a



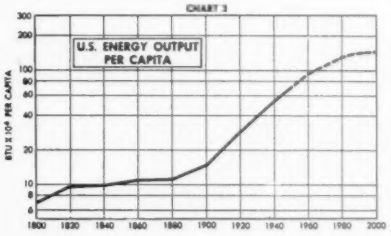
projection to the year 2000, when we look for the figure to be 278,000,000. For this projection, reliance has been placed on the new revised projection, No. 123, of the Bureau of the Census, Series P-25, released October 20, 1955.

Energy Output

Second, in Chart 2, there is projected the energy output of the total system, per capita. The trend in the United States, and, for that matter, throughout the world, is from an illiterate subsistence farming economy to a literate industrial-urban-farm pattern of life. Fewer people produce more foods and fibers on the farm. Technology grows in effectiveness, and man's ability to work cooperatively in organizations increases. Large quantities of relatively cheap energy become available.

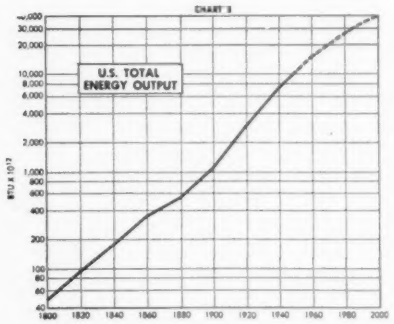
The curve begins to bend upward around 1880 and for the most recent 50 or 60 years, per capita output in the United States has grown at an annual rate of 3.4 per cent. The projection to the future is for somewhat of a decline in this rate of increase. It is of interest to note that the figure for the year 2000 — 144,000,000 Btu per capita—corresponds somewhat closely

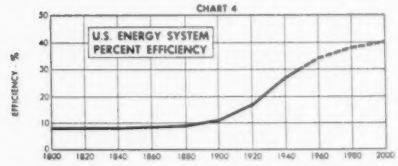
to the annual energy requirements for heating an average home in the northern part of the country.



Energy System Efficiency

As the product of population and energy output per capita, we obtain total energy output for the system, shown in Chart 3. To this output, which is expected to increase threefold over the balance of the present century, we must next apply the efficiency of the





system. This composite, over-all energy system efficiency is shown on Chart 4.

For the first 60 to 80 years of the last century the system efficiency remained constant at about 8 per cent, the efficiency of a colonial fireplace.

Since 1900, however, it has increased threefold to around 30 per cent. During this period, there has also been a significant change in the makeup of the energy system as between comfort heating, process heat, and energy for work. Chart 6 shows this change.

Energy Uses

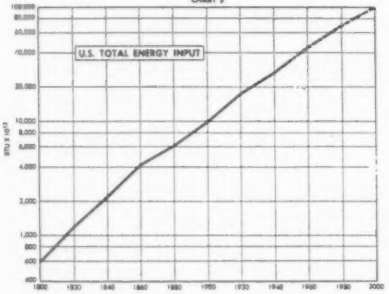
As to comfort heat, it has dropped from 55 per cent of total energy in 1900 to about 35 per cent in 1955. Once everyone is warm, growth in demand for comfort heat will be proportional to population. Over the same period, the efficiency of energy use for comfort heat has risen from 50 per cent to above 60 per cent. Process heat has remained fairly constant at 11 per cent to 12 per cent of the total, but its efficiency over the period has risen from 30 per cent up to 45 per cent. Energy for work has enjoyed the major gain, from 35 per cent to total up to 55 per cent, and its efficiency has risen from around 18 per cent, to 20 per cent at the turn of the century, to about 25 per cent today. One element of work energy, generation of electricity, was only about 4½ per cent efficient in 1900, is 23 per cent to 24 per cent efficient now, and may rise to over 30 per cent efficiency by the year 2000.

The growth in energy for work, whether for power plants, internal combustion engines, or whatever, means more energy per manhour and provides the extension of man's own physical abilities in ways that make our rapidly increasing standard of living possible. Note that sometime around 1910 to 1920 the country passed through the period of most rapid rate of change in its total energy pattern.

As Chart 4 indicates, it is expected that the overall efficiency of the energy system will increase from the present 30 per cent only up to around 40 per cent by the end of the century. Since the possibilities for improvement in system efficiency seem to be diminishing, future increases in demand for energy output must be met, to a greater extent than before, by proportionate increases in input of energy. The problem of supplying future growth needs thus becomes increasingly acute.

Total Energy Input

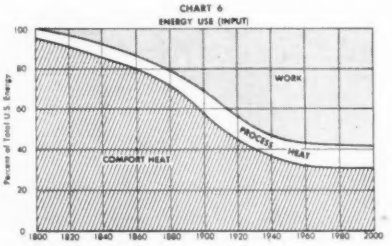
Total energy input, shown in Chart 5, is obtained by applying the efficiency projection to that for energy output. From 10,000 trillion Btu in 1900 the system has now grown to about 35,000 trillion. By the year 2000, the input may increase threefold to 100,000 trillion. For the present century, the pro-



jection of energy requirements shows a tenfold increase. This clearly raises a question as to where all this energy will come from, and it must be found in conveniently usable forms at reasonable prices if the increase in our standard of living is to be continued.

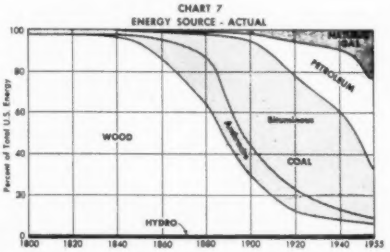
Sources of Energy

If we consider now the sources of energy that have been available to the economy and their relation to each other, we can see from Chart 7 that wood was the principal source in the



1800's. It is still a big factor, but is losing ground percentagewise and this trend will probably not be reversed.

Hydro is a surprisingly small factor, about 1 per cent now and, although growing, is not expected to provide over 1½ per cent of the total energy input by the year 2000. Coal commenced growing in importance around 1840, leveled off at around 65 per cent of the total input from 1900 to 1920



and has been declining in importance since that time. This trend, however, appears to be reversing and coal may again increase in importance in the near future.

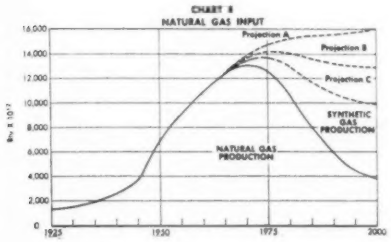
Since the turn of the century, both petroleum and natural gas have grown tremendously in importance. As yet, this growth continues unabated, but some warning signals are beginning to appear. Nuclear energy is still pretty much in the talking and planning stages. Chart 7 presents the major elements in the energy system as they relate to each other in competition for the user's dollar, "in the round," as we have noted, and not in the usual fragmentary treatment of one energy source at a time "in a vacuum" as we are accustomed to see them.

To get a perspective on the future, let us next examine the situation of each of the principal components of the system today, plus one new one that doesn't yet appear as a major factor, atomic energy.

Natural Gas Input

Chart 8 is a projection for natural gas. It is based on Lyon Terry's estimate that total ultimately recoverable reserves in the United States will reach 600,000 trillion Btu—that's about 600

trillion cubic feet of 1000 Btu natural gas. As of now, we've produced 125,000 and proved reverses are of the order of 215,000, a total today of 340,000. That means that to end up with 600,000 total, there must be discovered another 260,000 trillion cubic feet.



Our facts are not as full as we could wish because, until the drill bit discovers reserves, there is no way of being sure what lies below the earth's surface. In addition to Terry, however, others have also estimated total gas reserves — the Paley Commission, Palmer Putnam in his *"Energy in the Future,"* Howard Hinson of Continental Oil and, most recently, the McKinney Committee reporting to Congress on the future of atomic energy. This last report uses 850,000 trillion Btu and hints at the possibility of 1,000,000 trillion Btu as the ultimate figure. These estimates differ from Terry principally as a result of higher gas-oil ratios currently being experienced.

Whichever turns out to be correct, we should expect a finite limit of some sort to gas reserves. Moreover, as producers turn to deeper horizons, we may expect costs of production to increase, too. Except for Canada and Mexico, there is little prospect for importing natural gas. Many of us feel that the rising cost of future discoveries and the limits imposed by reserves will mean supplementation of natural gas with synthetic natural in the not too distant future.

Effect of Research

Research is going forward in the industry, principally along two major approaches. One is a two-step approach where a low-heating-value synthesis gas is made from coal or oil and such gas is then improved in heat content per cubic foot by the process of methanation. The other approach is by the direct hydrogenation of coal into a synthetic natural gas. Those of us in the AGA Committee on Economics have been urging an acceleration of both approaches in the research program, with the immediate objective of achieving integrated experiments from raw material to finished gas for both.

With the present state of the art, neither process can now produce a really cheap synthetic natural gas, but we are close and expect that research and acquisition of "know-how" will bring the costs of at least one of the processes well into line. We have urged that January 1, 1958, be selected as a target date for completion of the integrated experiments and a day of decision as to whether the industry should then go ahead with a full-sized synthetic natural gas plant. This plant could well be charged to research much as the electric companies, in groups, are handling today's atomic energy plants in an effort to gain "know-how" on that source of energy.

New Gas Markets

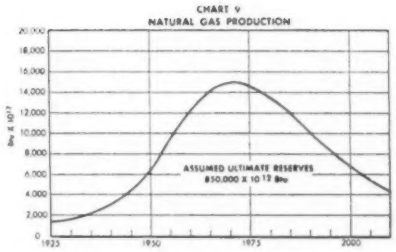
Returning to Chart 8, it will be seen that the period of most rapid growth is coming to an end. This is understandable, since pipe lines soon will bring natural gas to virtually every major market area in the country — the Pacific Northwest will receive it this fall and there is now before the Federal Power Commission a project to serve the main Florida peninsula. Moreover, we can expect a slow-up as a result of the recent increases in the field price of gas.

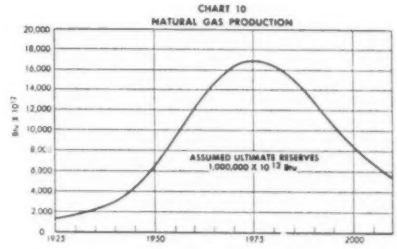
These increases will shut out some power plant markets and have already influenced the location of energy-cost-conscious industries, like aluminum and the heavy chemicals. The recent moves are not to Texas and Louisiana but to the Ohio Valley where large volumes of low-cost coal now provide a cheaper long-range source of bulk energy.

Also on Chart 8 are shown three projections as to possible synthetic gas production. The projections are: A, the most desirable from the standpoint of development of the industry, one which assumes synthetic natural will pick up the slack when natural availability begins to decline; C, one-half of the program assumed for A; and B, a program halfway between C and A. Their principal purpose is to give some measure of the possible magnitude of the problem. Note also that, on the basis of Terry's reserve estimate, peak annual natural gas production of around 13,000 trillion Btu would be reached by 1970 with some synthetic production coming in five years earlier. This is based solely on the reserves limitation. Price could change the shape of the curves and make synthetic natural a desirable reality even earlier than this.

Natural Gas Production

Charts 9 and 10 are similar to natural gas production curves of Chart 8, differing only in ultimate reserve estimates. If 850,000 trillion Btu is as-



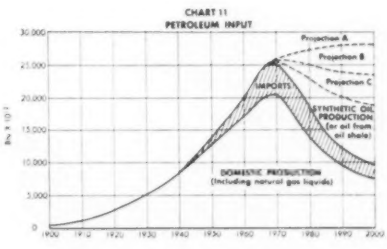


sumed, natural gas production might still peak in 1970, but at a higher figure around 15,000 for that year. The 1,000,000 trillion Btu assumption brings the peak to 17,000 and postpones the projected peak year until after 1975.

These higher reserve estimates could mean a slowing up of the need for synthetic natural, but price could counteract the effect. We may conclude that if we can find an economical method for manufacture, we shall need it somewhere between 1965 and 1975. Research being a time-consuming process, we should drive through to conclusions to provide assurance to ourselves, the financial world, and our customers that gas is here to stay and that our dynamic industry is not in fact tied to one limited natural resource.

Petroleum Production

Turning now to petroleum, Chart 11 shows a marked similarity to the curves for natural gas. Here again, we have limited real facts as to the existence of undiscovered reserves. After study of the available estimates, Chart 11 was



built up on the assumption of 1,100,000 trillion Btu of "Indicated Ultimate Reserves" of petroleum, including natural gas liquids.

We have consumed about 330,000 to date and report proved reserves of around 210,000, a total of 540,000. If

the production curve of Chart 11 is to be realized, another 560,000 trillion Btu must be discovered before we reach the year 2000. Note that petroleum production may peak around 1970. This type of curve is typical of curves for a well or for an oil field.

Imports are shown on top of domestic production. This portion of the estimates is based principally on data published by Austin Cadle of Standard Oil Company of California in a presentation last fall before the American Petroleum Institute.

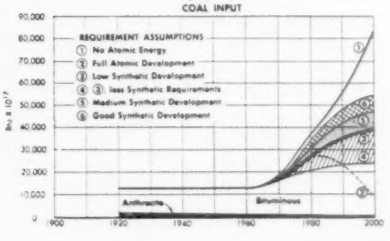
Synthetic Oils?

Synthetic oil production is also a very real possibility and here again A, B, and C, projections are shown. These are similar to the projections for synthetic natural gas. One highly probable synthetic oil source is in the vast shale oil reserves of Colorado and Wyoming. Total recoverable reserves in the entire country are estimated at 3,000,000 trillion Btu, but the drawback in development is in the large capital investment required for plant facilities and the need for water in the recovery processes known today. Oil from shale may also be a source for synthetic natural gas manufacture. Moreover, synthetic oil may be made from coal as well as oil shale.

Coal becomes the balancing item in our energy reserves picture today. Not only can it be consumed as coal, but it may be a most important source of hydrocarbons for synthetic oil or gas manufacture, as we have seen. From Chart 12, it will be seen that anthracite is and will remain a very minor factor. But coal, principally bituminous and sub-bituminous, may well come into its own again starting now and accelerating around 1965. Since coal has become the balancing element in the energy picture, however, any projection as to its future position must be qualified with a big "IF."

The No. 1 curve on Chart 12 assumes that atomic energy will not emerge as a major factor by the year 2000. At the other extreme, curve

CHART 12
COAL INPUT

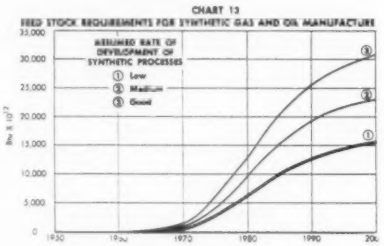


No. 2 assumes a full and optimistic development of atomic energy. For reasons to be discussed later, neither assumption appears warranted. Curve No. 3 assumes a low synthetic development—entirely based on coal as feed material. This corresponds to the C projections for synthetic natural gas and oil. This has been taken as the most likely for coal, since some of the synthetic will doubtless come from oil shale. Required coal production by the year 2000 is indicated at 38,000 trillion Btu compared with about 13,000 now. The shaded area between curve No. 3 and curve No. 4 indicates the coal required for synthetics production under these assumptions. Curve No. 5 assumes medium synthetics development and curve No. 6 assumes good synthetics development, all with coal as the basic raw material.

Feed Stock Requirements

Chart 13 sets out these feed stock requirements separately. Because of the reduction to a common Btu base,

CHART 13
FEED STOCK REQUIREMENTS FOR SYNTHETIC GAS AND OIL MANUFACTURE



if we assume equivalent efficiencies for the processes, the curves show total requirements for either coal or oil shale energy to supply synthetics production. Coal won't be the sole source and neither will oil shale. We don't know how much each will obtain of the potential market or how much the total will be. To be conservative, the low synthetic development curve has been selected for our projection into the future.

Coal Reserves

Coal reserves are not unlimited and here our facts seem better than for either petroleum or natural gas. There is some area of agreement that "Assured Recoverable Reserves" may be about 7,500,000 trillion Btu. There may be as much as 25,000,000 ultimately recoverable, but two-thirds of this is not recoverable on an economical basis. Of the assured reserves, 1,900,000 trillion Btu are located east of the Mississippi River.

Since the turn of the century, some 750,000 trillion Btu of coal has been burned in the entire country. This is equal to a little less than half of what remains in the East accessible to major industry. Total cumulative production to date is around 875,000.

Reserves are still large, but many are in the West and a lot are low grade. The lignites are difficult to handle and uneconomical to ship by conventional means. It is possible these coals may be gasified or made into oil to make them more readily transportable. In any event, it is more economical to transport hydrocarbons through pipe lines than by surface transportation, although the pipe lines are less flexible as to the specific markets given lines can reach.

Nuclear Energy

In considering the possible future role of nuclear energy, we get into a realm of high speculation, principally as to what will happen to nuclear power costs. We know that today the plant at Shippingsport, Pennsylvania, will produce electric energy for a total cost around 5.2 cents per kilowatt-hour. Other plants no win the planning and design stages hope to fall into the 9 to 10-mill-per-kw-hr range when they are completed some years hence. Before nuclear energy is really going to develop, the engineers must get these costs down, and there is every expectation they will be able to do so.

World reserves of fissionable materials are said to be 25 times the economically recoverable reserves of coal, and much of these reserves are in the United States. While not too much is public knowledge about reserves of uranium and thorium in this country, it has been stated by informed people that these metals available here in the United States could provide 100,000 trillion Btu of energy a year for several centuries. Thus, if costs can be brought into line, atomic energy has tremendous potentialities for the long-range future.

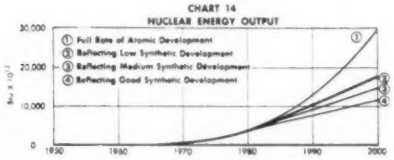
The principal use now visualized for atomic energy is for generation of electricity, and electricity supplies only a small portion of the total energy picture. Fuel-fired power plants now consume only about 4 trillion Btu a year. If atomic energy is to serve a large segment of the total energy requirements, it will mean that the makeup of the nation's energy pattern must be drastically changed.

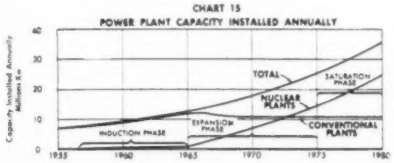
Without electrification of such energy applications as space heating, highways, and other means of transportation, nuclear energy may be limited to 10 per cent to 20 per cent of the total.

For this basic reason, we have assumed a program for atomic development that will end up around 20 per cent of the total energy requirements by the year 2000. The heavy line on Chart 14 is based on this assumption. It also corresponds to the low rate of synthetic oil and gas development we have discussed.

There is also some thought that atomic energy may aid in the efficient gasification of coal, but it is a little early to evaluate the possibilities that may result from this investigation.

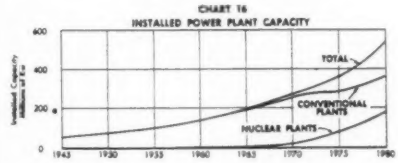
Chart 15 supports Chart 14 and reflects a 7 per cent annual rate of increase in installed generating capacity. We have then assumed that the 9-10





mill cost range will drop to 6-7 mills by 1965, with the result that about 5 per cent of the new capacity that year will be nuclear. This would bring us out of the induction phase of development and into the expansion phase.

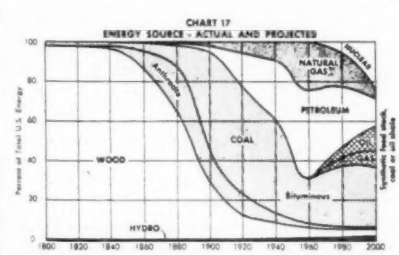
As costs come into line, the percentage of new plants that are nuclear might rise to 60 per cent by 1960. Here the saturation phase of nuclear development would begin and the percentage of total new capacity might reach 70 per cent by 1980, at which time it would be expected that the total cost of nuclear energy would be down to 5 mills. Chart 16 shows the cumu-



lative effect over the years of the Chart 15 program. This is the optimistic program we have referred to as full development. While possible, it seems improbable that such a program will in fact be realized. We have adopted the curve No. 2 program for Chart 14 for this analysis. This is a little over half the full development program.

The Outlook

It now remains to put these projections for the future together for another look at the total energy picture "in the round." Chart 17 is the result. It shows



the decline in percentage of total for both petroleum and natural gas, the rise of a synthetics industry based on either coal or oil shale, the increasing importance of coal over the balance of the century and the emergence of atomic energy as a major energy factor. But nothing in the future is fixed or certain.

Although it seems unlikely at the moment, some of the possible sources of "Income Energy," like solar energy, the wind and the tides, might emerge as a significant factor. The role coal will play depends on development of synthetic oil and gas processes. The part shale oil plays likewise depends on development. The research needed to give atomic energy such a large part in the future is tremendous. Where oil and gas fit in will depend also to a large degree on research.

There is also the question of price, which may in turn also relate to research. Price relationships in the distant future are even more difficult to project, but there appears to be a similarity in oil and natural gas supply characteristics that would indicate the possibility of parallel courses for the prices of these two energy components. The price of coal may not take a parallel course to oil and gas, but even if it lags behind, its price has little correlation to the demand for gas and oil except for large-volume industrial boiler fuel use. Perhaps we may conclude that gas will catch up to oil in terms of price increase since World War II but that the similarity of supply problems for the future makes any large dislocation in oil-gas price relationships unlikely.

Given high gas space heating saturations to reduce the unit cost of distribution, the gas industry should be in fine position to retain its basic high volume markets as long as it can achieve positive results from research in time to assure continuity of gas supply at reasonable costs. The pursuit of such research to a satisfactory conclusion should be one of the industry's prime objectives today. The race will be to the swift, and the industry's destiny in the nation's energy pattern remains to be moulded.

While there is room for all known energy sources in meeting future requirements, the percentages each source achieves is yet to be determined. Now is the time for an aggressive reappraisal of the whole picture if the industry is to realize its full potential as supplier of energy to the consuming public.

The challenge should be accepted eagerly.

Acknowledgment

Presented at the AGA Chemical, Engineering, and Manufactured Gas Production Conference, Philadelphia, 1956.

* * *

Experience can keep you out of trouble in fighting corrosion, too.

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Eleventh of a series

Communication:

"Do You Want Superior Reports?"

Dennis Murphy

DID you ever scratch around like a one-armed paper hanger with the hives to gather up facts, write a beautiful report, and send it to your boss — never to hear of it again?

You almost sweat blood while writing the darn thing, and, as you wait for weeks, you grow mad enough to quit! You would, too, if it weren't for your wife and kids. Why didn't your report get through and bring some kind of reaction? Probably unread, it's been filed away to gather dust. What's wrong?

Chances are: its timing was off, it got smothered by more urgent business, it covered information already found from another source, its problem has been resolved or changed, or it was too long and ponderous to plow through. Yet the receiver could at least have said, "Got your report, Jack, but haven't found time to study it!"

How Do You Report to Your Boss?

All executives, managers, supervisors, and first-line foremen rely on reporting. Study your boss to learn what kind of information he wants and needs; then try like the dickens to please him. Ask him outright how he prefers your reports. You have four ways to reach him:

1. **By telephone.** This is the quickest for a short oral report; but words and figures can be misunderstood, or forgotten if they're not recorded. Keep a penciled record of each call, and *be sure to date it.*

2. **By interview.** This excellent way to report allows you to show and explain with your voice, motions, facial expressions. You learn more about people this way, and the meeting of two minds is a test of quick-thinking — but it's so time-consuming that few top men can afford it. That's because some people can stay longer in five minutes than others can in an hour!

3. **By memorandum.** This is the quickest written report (excepting the informal note) and is recorded with at least two dated copies, but a memo can bog down in the routine delivery of the boss's mail. Mark it "Personal" or "Confidential," and you'll get results!

4. **By written report.** Let's examine this accepted way of communicating on complex, technical material. It's the most formal and complete, but the slowest because it requires study. Any number of copies can be made, and it's a permanent record.

What Is a Report?

A report is *not* a useless piece of "busy work" to justify an employee's existence, an exercise in written English to give the boss some practice in reading, or an excuse for another raise in salary. The written report is a powerful instrument for getting the job done, and the best report carries information "hot enough" to be of value *now*.

Dr. Murphy is administrative assistant, Service Pipe Line Company.

Report is a Communication

The word *report* means "to carry back." So report is an orderly account of some matter that's been investigated for the boss. This is done by research ("searching again"), experiment, inquiry, observation, study — any means of reaching right conclusions about the matter. With facts as evidence, it tries to treat its subject fairly and honestly.

Kinds of Reports

We have as *many kinds of reports* as we have bosses, workers, and jobs. As to subject matter, we may call them financial, engineering, geological, and the like. As to function, we may call them periodic (daily, weekly, monthly,) progress, analytical, critical, and the like. No matter what we call them, *they're all communications.*

And we have letter reports, memo reports, and long formal (sometimes bound) reports. We may think of most of them as going from employees *to* management; but stockholders, supervisors, employees, and customers also receive reports *from* management. They travel in all directions, up and down, over and across. But no matter how they move, *they're all communications.*

Parts of the Usual Report

Each report should fit its own subject matter, purpose, and audience. Any slavish conformity to an outline will end in a lot of balderdash and bury the main points; yet top managers will find it easier on them if all intracompany reports follow a uniform order, typography, and setup. Here's a flexible out-

line suggesting the relative importance of parts to the usual reader:

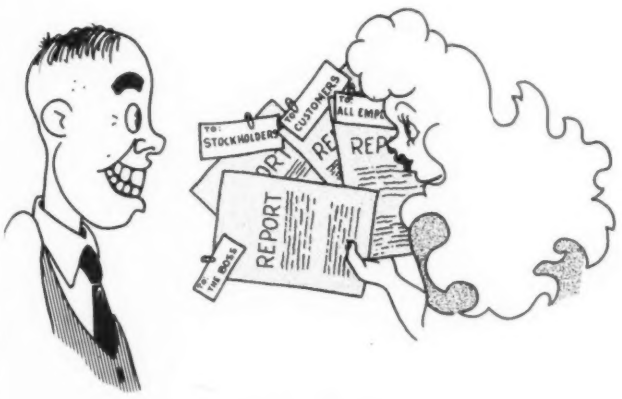
1.	**Cover**	**Secondary**
2.	**Title page**	**Secondary**
3.	**Table of contents**	)
4.	**Letter of authorization, letter of transmittal, foreword or preface**	) **Optional**)
5.	**General Summary**	**Most Important**
6.	**Suggestions and recommendations**	**Very Important**
7.	**Body — step-by-step discussion of subject**	**Very Important**
8.	**Appendix — including charts, illustrations, photographs, diagrams, figures, graphs, maps, bibliography, etc.**	) **Important**) **or**) **secondary**) **or optional**

The first four parts are relatively unimportant; the last four are highly important. Often a descriptive title for (2) will take care of (4). The table of contents is necessary for reports under five pages; for those over five pages, it can serve as an outline. Frequently (5) and (6) can be combined. And a company might profit by the use of uniform covers for all its reports.

Frankly, I wish we could reduce the number of formal written reports, shorten them by cutting out parts that cause repetition or backtracking, and make them all more readable, but we can streamline or simplify the ones we *have* to write.

Diving Into the Actual Work

Whether the boss assigns your subject or you originate it yourself, you surely have some general notion of its background from preliminary study. It's still a pretty good plan to write a brief statement of exactly what you're going to do — to clarify the problem in your own mind. You may need to use both *primary sources* (the thing itself) and *secondary sources* (what others say about the thing) in your research.



Reports Go in All Directions

1. **Collecting.** Gathering data and information is slow, arduous work. Collect only facts, figures, and ideas that are reliable and representative, and record each item on a separate note card of, say, 3 x 5 in. Keep thinking about your total report and visualize it in finished form. This is important.

2. **Organizing.** Organize, sort, and tabulate all data according to major and minor parts or sections of your whole study. This is the time to make a working outline from the natural divisions that your note cards fall into. Keep turning the whole report over in your mind, and try to visualize it complete.

3. **Writing.** Using your outline, dash off as fast as you can a first rough draft. Don't pay too much attention to proper language and punctuation, jerky transitions between paragraphs, or sentence structure — just get it all down on paper. The object here is to capture the body of your report in one continuous piece! Try to write this rough draft in one day; if you take three days at it, your report may sound as if three different people wrote it!

4. **Revising.** To write is human; to revise is divine. Let your rough draft rest a few days to "get cold." Turn your attention to something entirely different. Finally, wade back into it, coldly and critically, and polish it up. This painstaking work pays off; so revise long to make your report short. Cut all needless words, straighten out tangled sentences, check for smooth sequence, and make each word say exactly what you want it to.

Some General Tips

Follow the order of a news report in your daily newspaper: the headlines; the summary in extrabold or boldface type; and then the body of the story in standard type. Don't follow the order of a mystery story, or the boss may never find out how it ends!

1. **Keep one specific reader in mind — the man who will get it.**
2. **Explain clearly and briefly to him what your report's about.**
3. **Proceed from the general to the specific. First give the frame; then, the full picture.**
4. **Don't bury important points under an avalanche of details.**
5. **Be consistent in spelling, abbreviations, graph scales, and so on.**
6. **Use plenty of headings, subheads, and underlining to highlight your main points.**

Give Your Summary First

This is the most important part of your report. Why should it be buried in the middle of page 17 at the end of your discussion of the subject? It's *not* the same as a conclusion to the body of your report; so don't confuse the two.

Your summary tells briefly what your report's about and what you found out. It devotes a sentence or two to each of these: the purpose; the background; the method used; steps in the study, experiment, or investigation; and the results. *It's everything in a nutshell.*

No matter how technical or scientific the body of your report is, and no matter whether your reader is an engineer, chemist, or accountant — your summary *must* be in words that can be quickly understood by top men who are *not* engineers, chemists, or accountants. Use language a layman can easily understand. This means words that are simple, clear, and accurate.

Put your summary as near the front (or top) as possible. Hold it to one page, if you can; half a page is even better. Why? Purpose of this summary is to save your boss time and trouble — sweat, blood, and tears — headaches and ulcers.

Offer sound suggestions and recommendations, whenever you can, as a part of your summary. Your boss wants practical *answers*, not wild guesses or dubious conjectures.

Problems in Reporting

So far, we've been defining terms and talking about procedures in report-writing. Now let's discuss some major problems we frequently run into when reporting.

1. Get Your Assignment Straight.

Often slighted or overlooked, this first step in report-writing is important. Maybe you've spent weeks on a written report, only to hear: "That's not what I meant! The thing I've got to find out is — "

Why not get your assignment down in writing?

If it's given over the phone or in person, jot it down and read it back. This is your certificate of understanding. If given by memo or letter, it may not be wholly clear. Whatever you do, clarify the assignment before you plunge into work — or you may have it all to do over.

2. Watch Your Timing.

Proper timing is basic to good reporting. Knowing *when* to report on *what* amounts to that rare sixth sense, intuition. The wise reporter deals with problems that (a) are relevant, (b) need attention right now, and (c) are within his realm and power to help solve.

A forward pass has to be timed exactly right — or it's never completed. Just so, a report must arrive neither too early nor too late; but no formula works in all cases because of fast-changing factors. You can never get financial or operating reports in too early to suit management; and a report that's too late is worthless — like closing the barn door after the horse is stolen. You know that.

A good policy is: *report something now*, but don't expect a goal every time you shoot for one.

3. Who's Going To Read It?

If only the writer knew! You write for one man, but others read it. You send the original to your boss and a dozen duplicate copies to others on the management team, yet an expert outside the company may read it.

I find two extremes among those who read reports: (1) the man who wants *all the background and every detail* down to the gnat's eyebrow; and (2) the man who wants *only the relevant facts of immediate help* but will call for the substantiating details as he needs them. Try to write one report to satisfy both these men, and you find yourself between the devil and the deep blue sea!

My advice is: follow Aristotle's doctrine of the golden mean by striking a happy medium. If you must err, err on the side of giving too much. And stay loaded — in case the boss wants more details.

4. Who's Going To Write It?

Often executives get a "hunch" about something and ask for a report — to corroborate their preconceived judgment. If the report doesn't substantiate their supposition, they ask for more reports on the same subject from different sources. Sometimes the report-writers catch on, get their heads together, and come up with what the executives "want!" Collusion.

Invariably, the reporters squawk about being distrusted, about duplication of work, or about executives who don't know what they want!

No manager can predetermine what he wants in a report. If he could, he wouldn't need a report. And it's pretty shrewd management to assign the same topic to men in different departments. It gives top men a more rounded picture of the problem from different approaches, as well as a basis for comparing the work and worth of their reporters.

Often several men work jointly on a report. There's nothing wrong with this — so long as one writer whips the final version into a smooth, flowing style with no repetition or overlapping.

Perhaps, as Frank W. Abrams of Standard Oil (New Jersey) said of committee management: "It stands to reason that if you get five men together and one man is wrong, the mistake is going to be picked up. Or if one man has a good idea, the others will contribute to it and develop it. And if they all have good ideas, what comes out may be better than the separate ideas together." The same's true of report-writing.

5. Sell Your Ideas.

One man may approve your report; another won't. It's easier to "sell" one man than a dozen, yet a report tries to "sell" everybody! You want to convince and persuade your readers of the facts, yes, but you should never resort to propaganda to oversell anything.

Persuasion is the art of telling somebody where to go(!) so nicely that he actually looks forward to the trip. Salesmanship is important, but don't be afraid to report: "No conclusions are warranted by the material in this study."

Report writing offers excellent training in objective thinking because it should exclude your feelings on the problem, action, object, or material discussed. It's no place for inferences; it's no place for colorations that unduly influence; and it's no place for prejudicial hints that stop all further study and investigation.

A report should be proved and verified by facts. That shuts out a lot of hot air and propaganda while it also reveals how little we really want to be impartial, especially where our personal interests are involved. An honest report, however, slants both favorable and unfavorable judgments so they reveal the truth.

The best way to sell your report is to have abiding faith in it. Then keep your main ideas before the reader so he can't escape seeing them, believing them, and coming to the same conclusions you've come to.

6. Complete Your Work by Yourself.

During World War II, certain branches of our military used a method of report-writing called "Completed Staff Work." That method might also prove useful in business.

It works like this: the staff writer is assigned a problem to investigate. The more difficult the problem, the more prone he is to run with it piecemeal to his manager or boss to discuss its perplexing details. That's exactly what the writer should *not* do!

You should consult all available sources and records on your own. You should study, write, restudy, and rewrite until you complete the report by yourself. Don't worry your boss with questions or long discussions. It's so easy to ask him what to do, and it appears so easy for him to answer. Resist that impulse! You'll succumb to it only if you don't know your job. Present your report (or memo) to him only *in finished form* — ready for his approval or disapproval.

"Completed staff work" means grind and growth for you, but more freedom and fewer headaches for the boss. It protects him from half-baked ideas, from time-consuming paper work, and from immature oral discussions.

7. Make Suggestions Whenever You Can.

Why are some report-writers afraid to make any recommendations? If they can't speak with authority after thorough study on a subject, who can? Of course, as Alexander Pope said: "It is with narrow-minded people as with narrow-necked bottles; the less they have in them, the more noise they make in pouring it out." But truly learned men are usually quiet men.

Any boss worth his salt ought to want suggestions, even though he can't carry them out or even agree with them. But recommendations give the reporter an opportunity to exercise judgment and the boss an equal opportunity to measure it.

It is actually your job to make suggestions and advise your boss what *he* ought to do, not to ask him what *you* ought to do. He needs answers, not questions.

8. Use the First-Person Point of View.

The first-person *we* is vastly superior to the third-person *it*.

What's more, the plural *we* is usable and correct in the most formal reports — even the company's annual report to stockholders, customers, and employees.

What's the sense of saying *"It* is contemplated that" instead of *"We* contemplate?" Business writing never wants to tell *who does what!* Evasion. But we compliment everyone who helps us with a report when we say *"We* investigated this and *we* find" instead of *"It* was investigated and *it* was found."

Use of plural *we* makes writing easier, shows a sense of human cooperation, and adds authority to the report. Nothing sounds sillier than a reporter referring to himself as "the author" or "the writer." Then he really confuses all others, who think he's referring to someone besides himself!

9. Where Do Exhibits Go?

If exhibits are simple, clear, and highly relevant, you should interpolate them with your discussion in the body. You should place them right *after* their mention or description, not *before*.

But if the exhibits are extremely complex and not integrally necessary to the body, they merely slow up the reader and distract him. You should then include them in the appendix as supplementary material.

10. What's a Stenographer For?

Some reporters expect the stenographer to write up their material. "What're we paying her $400 a month for?" If she *can* write your report, you may be an unnecessary employee on the payroll.

You must assume the full responsibility for getting your material ready to type. In addition to shaping your ideas and organizing your composition, *you alone are responsible* for spelling, grammar, capitalization, punctuation, abbreviations, figures — their correctness and uniformity.

Accuracy of copy is your job as well as the stenographer's. Of course, if you have foresight and good sense, you'll train your stenographer to catch many errors, correct surface mistakes, and help you tremendously. But don't expect her to do all your work, and if there's an error in the content — don't blame the steno!

Values of Report-Writing

To you, the manager —

1. **Saves you time and trouble in gathering important facts**
2. **Helps you to solve problems and make decisions**
3. **Registers new trends, data, and events you might overlook**
4. **Gives you reliable "barometers" for measuring the company's pulse**
5. **Offers you tools for coordinating all company activities into a united, harmonious whole.**

To you, the writer —

1. **Affords you an excellent chance to sell yourself and your ideas**
2. **Shows your ability to understand, follow, and complete an assignment**
3. **Develops your power to study and investigate, select and evaluate, organize and interpret material**
4. **Tests your power to communicate clearly, concisely, and convincingly**
5. **Provides a vital link between you and management.**

A Good Report Serves Everybody

The Acid Test

Final test of your ability is simply this: if you were the boss, would you accept it and *stake your reputation* on its being correct? Would you be willing to *wager your bottom dollar* on its guiding you safely and straight?

If you would, your report's all right.

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FPC REPORT

Hearings in the reopened proceedings involving competing applications by Natural Gas Pipeline Company of America and Lone Star Gas Company on making additional gas supplies available to Natural from northwest central Texas, have been postponed indefinitely. They originally were scheduled for October 15, then moved to October 1, before being postponed. Decision by a presiding examiner was filed last February, and the case reopened in July after the commission heard oral arguments.

Postponed also until further notice are hearings involving applications of five companies on natural gas projects in the Midwest. Four of the five concerns involved have meanwhile filed new related applications and amendments to the initial filings. Companies involved include: Natural Gas Pipeline Company of America, Texas Illinois Natural Gas Pipeline Company, Chicago District Pipeline Company, Pacific Northwest Pipeline Corporation, and Colorado Interstate Gas Company. Facilities involved include 1329 miles of pipe line, 116,300 compressor horsepower, and other pertinent facilities.

Hearings on a $449,000 wholesale natural gas rate increase by Manufacturer's Light and Heat Company are scheduled for October 15 in Washington. The increase, suspended by the FPC in June, 1954, has been in effect subject to refund since November, 1954. Affected are wholesale customers in New York, New Jersey, Maryland, Ohio, Pennsylvania, and West Virginia.

Kansas-Nebraska Natural Gas Company and Northern Natural Gas Company have filed applications seeking permission to build facilities in the Oklahoma Panhandle that would allow K-N to sell gas to Northern. Hearings have been set for October 15.

Revised and up-to-date as of June 30, 1956, the new FPC map of major gas pipe lines in the United States is now available. Copies can be obtained for 25 cents each, directly from the Federal Power Commission, Washington 25, D. C. Ask for FPC M-46.

Three more companies have been exempted from FPC regulation under terms of the Hinshaw Amendment bringing the total to 99. Newest members of the exempt family include Southern Indiana Gas and Electric Company, Evansville, Indiana; and Granite State Gas Transmission, Inc. Allied New Hampshire Gas Company both of Portsmouth, New Hampshire

Glossary of Gas Industry Terms – In to Li

I

Instrument Piping: All piping, valves, and fittings used to connect instruments to main piping, to other instruments and apparatus, or to measuring equipment.

Insulated Flange: A set of flanges inserted in a pipe line, with the faces insulated from each other, for the purpose of stopping flow of electric current through the pipe.

Insulating Material: Any material of low thermal conductivity used to reduce the flow of heat.

Insulation: Protection against the flow of heat or the flow of electricity.

Integrated Company: In the oil industry, a large company operating in all branches of the industry.

Inter-cooler: A heat exchanger used to cool a substance between the stages of an operation, performed on the substance.

Intermediate Pressure: In gas distribution operations, pressures ranging from about 0.5 to about 5 psi.

Intermittent Process: A non-continuous manufacturing process in which each operation is done separately with intermediate handling between steps.

Intermittent Retort: A coal gas generating retort that operates on one batch of coal at a time with removal of gas and coke before charging the retort with the next coal batch.

Internal Combustion: Pertaining to any engine in which the heat or pressure energy necessary to produce motion is developed in the engine cylinder, as by the explosion of gas.

Internal Combustion Engine: An engine that operates by means of combustion of fuel within its cylinder such as gas, gasoline, oil, etc.

Internal Producer: One built into the setting of a bench of coal gas generating retorts.

Inversion Temperature: For any gas, the temperature at which throttled expansion produces neither heating nor cooling of the gas.

Ion: An atom or group of atoms carrying an electric charge as a result of gain or loss of one or more electrons from the atoms.

Iron Case Meter: A gas meter in which the external case is of cast iron.

Iron Oxide: A chemical combination of iron and oxygen, such as ordinary rust on iron.

Isobutane: A hydrocarbon of the same chemical formula as butane (C_4H_{10}), but slightly different molecular structure, resulting in different physical properties, notably higher volatility.

Isothermal: Occurring at constant temperature.

Isothermal Compression: Raising the pressure of a gas without changing its temperature.

J

Jack Hammer: A tool, usually powered by compressed air, used to break stone, concrete and asphalt.

Jack Shaft: A short shaft set between two machines to provide means for increased or decreased speed or for flexibility.

Jacket: The space surrounding a cylinder of an engine through which a cooling liquid flows. Steam engine cylinders are sometimes heated by steam circulating through a jacket to prevent condensation on the inside cylinder walls.

Jars: A device used in cable drilling, shaped like two elongated links and attached to the drilling tool so that it will strike the bottom of the well with intensified force.

Jet Condenser: A condenser in which a jet of cooling water comes in direct contact with the vapor to be condensed. The water is forced through a jet into a pipe of venturi shape, creating a partial vacuum, that together with condensation of vapor, draws a flow of vapor into the condenser.

Joint: A single length of pipe or tubing. A connection between two lengths of pipe.

Joule's Law: The law that there is no change of temperature when a gas expands without doing external work and without receiving or rejecting heat.

Journal: The portion of a shaft that rests and moves in a bearing.

Journal Bearing: A bearing that supports a journal.

K

Kelvin Scale: A temperature scale based on the average kinetic energy per molecule of a perfect gas and having zero on the scale at 273.8 deg below zero, Centigrade.

Kemsolene: A petroleum naphtha used as a solvent and having a boiling point of 290 to 300 F.

Kerosene: An oily liquid obtained in the distillation of petroleum, distilling off after gasoline in a temperature range from 174 to 288 C. A hydrocarbon of specific gravity 0.747 to 0.775. Used as fuel for some internal combustion engines, heating equipment and illuminating purposes. A heavy grade, known as range oil, is used for cooking and heating.

Key Rock: A rock stratum that can be identified over large areas and from which measurements can be taken to determine geologic structure.

Kiln: An oven or furnace used for such purposes as seasoning lumber, treating ores before smelting and firing ceramics and glass.

Kilogram-calorie (KC): The amount of heat necessary to increase the temperature of a kilogram of water one degree Centigrade.

Kilometer: 1000 meters; 1093.68 yards.

Kilowatt: A unit of electrical energy equivalent to 1000 watts, or approximately 1⅓ horsepower.

Kinematic Viscosity: A measure of the resistance of a fluid to flow, including the effect of fluid density. It is equal to the absolute viscosity divided by the density.

Kinetic Energy: The energy possessed by a body due to its own motion.

Kosmobile: Dustless gas carbon black granules used in rubber formation.

Kosmos: Compressed carbon black made from gas and used in rubber formulations.

L

Lagging: Asbestos and magnesia plaster used on process equipment and piping as a thermal insulation.

Lag Screw: A heavy screw with a square bolt head.

Laid Length: The length measured after pipe is placed in position. It includes such items as gaskets or space between ends of pipe in coupling or the insertion of bell and spigot joint or the central ring of C. J. HUB.

Lamp Black: A powdery form of carbon produced from the burning of gas, or other carbon-containing fuel, with an insufficient air supply and cooling the gases from the flame below the combustion temperature of carbon, so that a sooty deposit of lamp black is formed.

Lamp Wax: Paraffin wax.

Lap Weld: Overlapping of edges of pieces to be joined, with the weld made between the edge of one piece and the body of the other piece.

Large Port Burner: A burner having a single large discharge opening.

Larry: A traveling crane on rails and provided with a hopper for carrying solid materials.

Latent Heat: Change in heat content of a substance when its physical state is changed.

Latent Heat of Vaporization: The quantity of heat required to change a unit weight of a liquid to vapor with no change in temperature.

Lateral: A pipe, in a gas distribution or transmission system, that branches away from the central and primary part of the system.

Lay In: Place a pipe line in its ditch.

Laying Cat: A Caterpillar tractor having a side boom used to lay pipe.

Layout: A drawing or chart showing the relationship of various pieces of equipment to each other in a plant.

Lay Up: The construction method in which bricks, blocks, tiles or similar materials are set in a suitable mortar to form the desired structure.

Laying Mains: The whole operation of installing piping systems in towns or cities including trenching, joining sections of pipe, laying pipe in trenches, back-filling trenches and cleaning up.

Lead Joint: A method of joining sections of cast iron bell-and-spigot pipe in which the bottom of the joint is packed with oakum, followed by lead wool or molten lead that is hammered into place to provide a gas-tight seal.

Leakage Surveys: Systematic surveys made for the purpose of locating leaks in a gas piping system.

Leak Clamp: A clamp used to press a gasket against a leaking section of pipe or pipe joint to seal the leak.

Leak Detector: A chemical or electrical device that detects and locates gas leaks in piping or equipment.

Lean Gas: The gas with comparatively low heating value produced at the end of the carburizing period of a coke oven or coal gas retort plant. Also, the remaining natural gas after gas containing liquids has gone through an absorber.

Lean Mixture: A mixture of air and fuel in which air is supplied in excess of combustion requirements.

Lean Oil: Absorption oil returned to the absorber of a natural gasoline plant after the natural gasoline has been distilled from the oil.

Lease: A contract for possession and profit of property for a set period in consideration of payment of rent; the document by which such rights are conveyed. Also, an area of land leased for development of minerals; the property occupied by any given minerals producer.

Lease Hound: A dealer in oil and gas leases; a person who obtains leases for an independent oil operator or an oil company.

Leather Oil: A mixture of mineral oil, neatsfoot oil, olive, lard or fish oil, used for leather treatment to loosen and soften fibers and impart good wearing qualities; used to treat diaphragms in gas meters.

Leduc's Rule: The volume of a gas mixture is equal to the sum of the volumes that would be occupied by each of the components of the mixture if at the temperature and pressure of the mixture.

Lehr: An oven used for the controlled heating and cooling of glass-and-ceramic-ware.

Length: A piece of pipe of the length delivered from the mill. Each piece is called a length regardless of its actual dimensions. This is sometimes called "joint" but "length" is preferred.

Lenses: Oil pools formed by variation in sedimentation in the original formation of sedimentary beds and not identified with definite geologic strata.

Lift: One of the movable sections of a liquid-sealed gas holder; the vertical distance a liquid is pumped.

Lifting Flame: See: Floating Flame.

Light Fractions: Low specific gravity oils from controlled distillation of crude oil; also substances such as benzene and toluene obtained in manufacture of coal gas.

Light Fuel Oil: Distillate fuel oil of grades 1 and 2.

Light Off: Generally meaning to ignite or to burn away; in water gas manufacture, to burn the combustible portion of the blast gas formed in the preparation period of the gas-making cycle.

Light Oils: See: Light Fractions.

Liming Leg: That part of an ammonia still in which a solution of fixed ammonia compounds are mixed with lime before further processing.

Linear Velocity: Distance moved in a straight line, per unit of time; such as, feet per second and miles per hour.

Line Fittings: Fittings used in piping to change the direction of the pipe line or divide the flow between two or more pipes; includes elbows, tees, crosses, and y's.

Line Governor: See: Governor.

Line Pipe: Seamless steel pipe used in such pipe line transportation as petroleum and gas.

Linerider: An employee who inspects a pipe line for leaks. At one time he walked or rode horseback; today, he uses an automobile or a light aircraft.

Liquefaction of Gases: A gas may be liquefied by subjecting it to pressure and then cooling it to its critical temperature.

Liquefied Gas: Gas may be converted to liquid by combining the effects of compression with cooking. In the manufacture of natural gasoline from casinghead gas, the gas is generally compressed and then cooked while under compression. This causes condensation and results in liquefaction.

Liquefied Petroleum Gases: LP gases or LPG; petroleum hydrocarbons of the paraffin series, normally gaseous, such as propane, butane, and iso-butane, but that can be compressed to liquid form. Sold in tanks for gas service to customers not served by gas utilities, and in bulk to utilities for peak-shaving and standby gas.

Liquid: A physical state of a substance in which it will continuously deform when subjected to a shearing stress.

Liquid Air: A liquefied gas composed of air.

Liquid Flow: The flow of liquids in generally given terms of gallons or cubic feet per minute. This depends upon the impressed pressure (unbalanced) the viscosity of the fluid, its temperature, the nature of the surface over which it flows, and the shape of the orifice through which it passes.

Part 7 of Gas Fundamentals will appear in the next issue.